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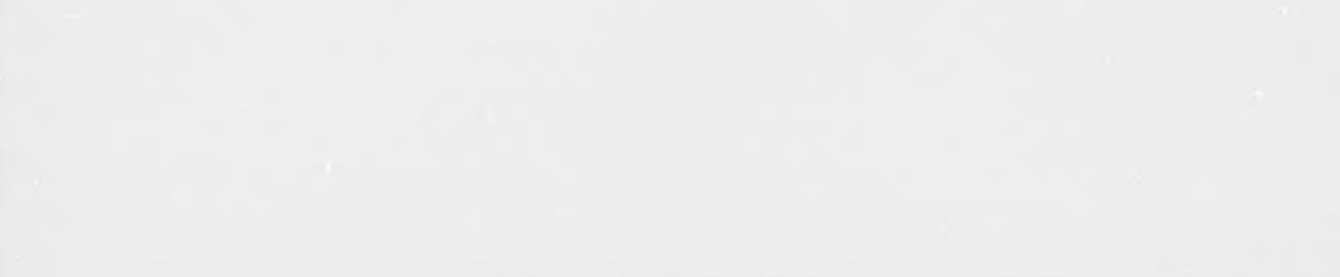

ASSESSMENT OF LOT REGRADING PROGRAMS RELATED BYLAWS AND PUBLIC INFORMATION

March 1992

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The views and conclusions expressed and the recommendations made in this report are entirely those of the authors and should not be construed as expressing the opinions of Alberta Municipal Affairs.

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FOREWORD

The project documented in this report received funding under the Innovative Housing Grants Program of Alberta Municipal Affairs. The Innovative Housing Grants Program is intended to encourage and assist housing research and development which will reduce housing costs, improve the quality and performance of dwelling units and subdivisions, or increase the long term viability and competitiveness of Alberta's housing industry.

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Input from Gordon Thompson, General Manager of the Capital Region Sewage Commission, is much appreciated.

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EXECUTIVE SUMMARY

Over the past ten years, in some areas of Edmonton and Strathcona County, during heavy rainstorms, sanitary sewers have backed up into basements, sewage treatment plants have been overloaded and raw sewage has discharged into the North Saskatchewan River. Contributing factors included combined storm and sanitary sewers in Edmonton, stormwater infiltration into weeping tile drains, inflow through the tops of sanitary sewer manholes and infiltration into sanitary sewer pipes and manholes.

To combat this problem, both municipalities increased the capacity of the sanitary sewer system in hard hit areas, mounted a public awareness and education campaign to improve lot grading, and launched lot regrading programs in Dunluce/Warwick and Lago-Lindo in Edmonton and Sherwood Park in Strathcona County. The programs were initiated to decrease the amount of surface water entering the weeping tile system.

The purpose of this project was to make an assessment of these education and lot regrading programs, to draw up guidelines for future lot regrading programs in developed areas, and to serve as a reference for other Alberta municipalities where there is a need to implement similar programs.

Information was obtained from both municipalities by interviewing personnel who had been involved in the administration and implementation of the programs. Also, documentation in the form of plans, pamphlets, reports and copies of bylaws was made available. Questionnaires were delivered to over five hundred householders and one hundred and fifty seven replied.

A field survey of 63 lots was carried out and the results were utilized in the assessment.

Five key issues were addressed in this report:

1. Bylaws - right of entry and enforcement.
2. Public Education
3. Implementation - work done by householders or municipality?
4. Efficiency - what improvements were effected to lot grading?
5. Effectiveness - by how much was storm infiltration reduced?

The main findings are as follows:

1. Bylaws

   Each municipality had bylaws in place which defined lot drainage standards. Pending Provincial Government legislation will clarify and reinforce right of entry for lot inspections by municipal employees.

2. Public Education

   The public education programs generated by both municipalities were comprehensive. One-on-one information dissemination was most effective.

3. Implementation

   No obvious differences in quality were perceived between the regrading work done by householders and the work done by contractors or municipal employees. The City of Edmonton program was voluntary and the County program was compulsory. The County program had more participation and appeared to be more cost effective.

4. Efficiency

   Decks, concrete driveways and patio/garage areas were not included in the lot regrading programs. As a result, the efficiency of the programs fell short of 100%.

The survey of lots revealed that, even after regrading, generally more than 20% of lot area still drained towards the house. In these cases, proper installation of downspout extensions would reduce the percentage draining towards the house to 14%.

5. Effectiveness

The effectiveness of the County and City programs has not been measured for the following reasons:

.1 Lack of pre-event flow monitoring information.

.2 In both lot regrading areas, before lot regrading took place, the capacities of the sanitary sewer systems were enlarged to accommodate storm infiltration. This enlarging of capacity played a major role in preventing reoccurrences of sewer back-up. Thus, the effectiveness of the regrading programs cannot be based on the absence of subsequent basement flooding.

6. Conclusions and Recommendations

The procedures of each municipality were different, but each showed a high degree of efficiency in execution.
A program that is compulsory, that is backed up by enforceable bylaws and has the homeowners themselves doing the work, leads to greater participation and more chance of success.

Municipalities should analyse their sanitary sewer systems to determine whether they might be exposed to flooding in the future. If the analysis shows that the possibility exists in a municipality, it should launch a prevention program.

To start the program, a thorough sanitary sewer flow monitoring program should be implemented for large areas and for smaller pilot areas.

Once the monitoring program establishes sanitary sewer flows in the system, lot regrading work be implemented in one or more pilot areas, with monitoring continuing to measure the success of the work. The data determined would be used for planning further programs in the municipality.

1.0 INTRODUCTION

1.1 The Problem

In drainage systems where the weeping tile drains are connected to the sanitary sewer and lots are graded improperly, surface run-off can enter the sanitary sewer system by way of the weeping tile. This contributes to surcharging during periods of rainfall which can cause back-up of raw sewage into basements and/or cause problems at sewage treatment plants.

Other factors contributing to storm-related flow in sanitary sewers are combined storm/sanitary systems, improper roof leader discharge, temporary rise in water table, inflow through manhole covers, cross-connections from storm sewers and infiltration into pipes and manholes.

Sanitary sewage backing up into a house basement is a serious problem. Quite apart from the health hazard, the cost of clean-up and replacement of damaged goods is high. Potential health problems are created when storm-related flows exceed the capacity of sewer trunks and sewage treatment plants, and untreated sewage is discharged to public waterways.

Some residents are unaware of the role that poorly graded lots play in surcharging sanitary sewers and are unwilling to co-operate in the execution of remedial measures.

In areas where the problem has become apparent, some municipalities have implemented a sump pump system for weeping tile to replace draining to the sanitary system. Also, new bylaws have been created to provide for certification and inspection at various stages of development to ensure proper lot grading.

However, there still remains a problem with lots which were developed before intensified lot grading guidelines and inspections were instituted, and where the weeping tile is connected to the sanitary system.

In various residential areas, where grading was poor in the first place, or where settlement over time has caused reverse drainage to basement walls and weeping tile drains, surcharging of sanitary sewers happens as regularly as severe summer storms occur. The majority of lots do not experience flooding themselves, but contribute to the flooding of basements situated downstream.

In municipalities where new development occurs, even if sanitary flows are controlled to normal design flows with no stormwater addition, the incidence of storm-related sanitary sewer surcharging in older areas downstream can become more prevalent. Indeed, surcharging may occur on a frequent basis in areas where sanitary sewers had capacity to handle excess infiltration flows, and thus did not flood, before expansion of the drainage basin.

Where poorly graded lots contribute to surcharging of sanitary sewers there is clearly a requirement for regrading the lots that cause the problem.

1.2 Project Objectives

The objectives of this project were to review completed lot grading programs, along with related bylaws and public education efforts, with the aim of determining the most effective methods, plans of action and procedures for rectifying lot grading in established development areas to minimize inflow of storm water into sanitary sewers via the weeping tile system.

1.3 Scope and Focus of Work

The scope of the work comprised a review of lot regrading work done in two municipalities-Edmonton City and Strathcona County, an evaluation of these programs on the basis of efficiency and effectiveness, and recommendations regarding guidelines for future lot regrading programs.

The work focussed on an examination of the lot regrading programs in Edmonton and Strathcona County from the points of view of:

1. public relations
2. legal aspects
3. implementation
4. cost
5. efficiency
6. effectiveness

1.4 Organization of the Report

Section 1 -	Introduction
Section 2 -	Strathcona County Lot Regrading Program (provides historical background and describes the program)

Section 3 - City of Edmonton Lot Regrading Program (provides historical background and describes the program)

Section 4 - Analyses (reviews and analyses the programs in each municipality)

Section 5 - Conclusion

Section 6 - Recommended Guidelines for Lot Regrading (proposes guidelines for lot regrading programs in any municipality)

1.5 Previous Work in the Field

Municipality-managed lot regrading and retrofit programs have not been previously performed to the same scope and extent as the two programs that are the subjects of this report.

1.6 Sources

Information was collected from Strathcona County, the City of Edmonton and the citizens of both municipalities who replied to the questionnaires.

1.7 Proposed Treatment of Findings

The recommendations contained in this report may be beneficial to other municipalities planning to implement lot grading or regrading programs.

2.0 STRATHCONA COUNTY REGRADING PROGRAM

2.1 Introduction

Heavy rains in the summer of 1983 caused flooding in a large number of basements in the Hamlet of Sherwood Park (approximate population 25,000), Strathcona County. The main cause of flooded basements was back-up of sanitary sewers which had been over-loaded with storm water. The major source of that storm water was perceived as being weeping tile drains which were connected into the sanitary system.

In 1985, Strathcona County implemented a $10.8 million sanitary sewer relief program which increased the capacity of the sanitary sewer system to accommodate increased flow during storm events. The program consisted of rerouting, enlarging and twinning several parts of the sanitary sewer system in Sherwood Park. The relief program was successful in that, to date, in Sherwood Park, the incidence of flooded basements due to sanitary sewer back-up during major rainstorms has been drastically reduced.

In conjunction with the 1985 sanitary sewer relief program, Strathcona County also placed a ban on connecting weeping tile drains to the sanitary sewer system in new housing. Since 1985, a sump pump system to convey the weeping tile flow to the surface has been a requirement for all new residential housing in the County.

The 1985 sanitary sewer relief program solved the problem of widespread basement flooding by enabling the sanitary sewage collection system to convey large amounts of stormwater without surcharging and backing up. However, the increased flows during storms caused problems at the Capital Region Sewage Treatment Plant.

Large flows cause problems to the sewage treatment process because:

1. The wide range in volumes caused by storm-related flows causes a cycle of solids deposition in the transmission lines in dry times, and heavy solids transportation from the flushing effect of storm flows in storm times. The heavy solids flow adversely impacts the operation of the treatment plant.

2. Moderate storm flows exceed the capacity of secondary treatment and wash out the activated sludge process.

3. Very heavy storm flows hydraulically overload the system, thus untreated sewage is diverted into the North Saskatchewan River as an emergency relief measure. The latest incidence of this occurred as recently as July 1990.

The County was made aware of these problems by the Capital Regional Sewage Commission and made a commitment to the Commission that it would act to minimize the volume of rainwater entering the sanitary sewer system.

In July 1986, a Municipal Policy Handbook entitled Lot Drainage Policy and Correction Program was approved by the Strathcona County Council. The stated objective of this Policy was:

"... to reduce the infiltration through weeping tiles into the sanitary sewer system in Sherwood Park by improving the surface drainage at and around the affected buildings in Sherwood Park".

The Policy also stated:

"Each residential lot will be surveyed by the Engineering Services Department ...".

On March 3, 1987 the County Council approved Bylaw 10-87, "The Property Drainage Bylaw", which encompassed the above policy objectives.

After Bylaw 10-87 was passed, the Strathcona County Public Works Department implemented the Sherwood Park Lot Grading Improvement Program.

2.2 Description of the Program

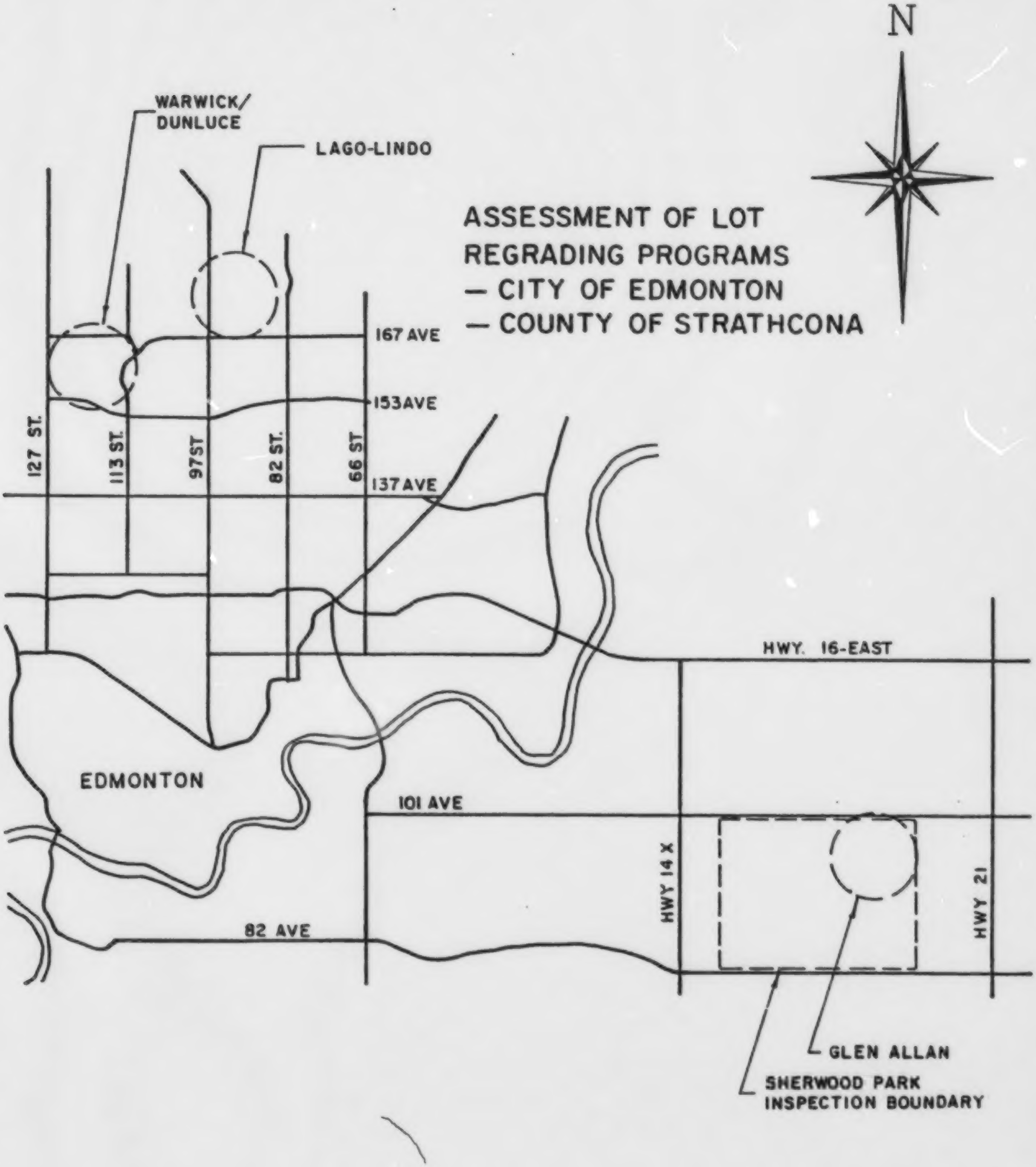
The purpose of the Sherwood Park Lot Grading Improvement Program was to improve surface drainage on existing lots in Sherwood Park and thereby reduce the flow of stormwater into the sanitary system. The program was implemented as follows:

.1 The Sherwood Park Lot Grading Improvement Program was initially promoted on a local television program, "Spotlight on Sherwood Park" in the fall of 1986.

.2 Appendix B shows four examples of full page advertisements that were run in the Sherwood Park News in 1987 and also an example of a pamphlet produced in May 1990.

.3 Starting in May 1987, County staff inspected all 7,618 homes within Sherwood Park constructed prior to November 14th, 1984. Refer to Figure 1 for the boundary of the Sherwood Park inspection area. These inspections were completed within a three month period. Two lot grading supervisors and 10 field inspectors (summer students hired as temporary help) carried out the inspections.

.4 Lot grading was evaluated within the 1.5 meter area around the perimeter of each home and the length of downspout extension attached to each downspout from the roof drainage system was determined. Three classifications, as described hereunder, were used to define the lot-grading status. All deficiencies,


N
WARWICK/
DUNLUCE
LAGO-LINDO
ASSESSMENT OF LOT
REGRADING PROGRAMS
— CITY OF EDMONTON
— COUNTY OF STRATHCONA
167 AVE
153 AVE
137 AVE
127 ST.
113 ST.
97 ST
82 ST.
66 ST
HWY. 16-EAST
EDMONTON
101 AVE
82 AVE
HWY 14 X
HWY 21
GLEN ALLAN
SHERWOOD PARK
INSPECTION BOUNDARY

LOCATION PLAN

SHERWOOD PARK/GLEN ALLAN AND CITY OF
EDMONTON/DUNLUCE WARWICK AND LAGO-LINDO

FIGURE 1

including an estimate of material requirement, were listed on an inspection form (See Appendix A) and a copy of this report was left in the homeowner's mailbox. The report was intended to be used as a guide in carrying out any remedial work.

The three classifications used to define the lot grading status around a residential unit were:

"Conformity" Status -
A positive slope of 3% or greater for a distance of at least 1.5 meters. No remedial work required.

"Recommended" Status -
A positive slope from 1% - 3% for a distance of at least 1.5 meters. Remedial work recommended but not mandatory.

"Mandatory" Status -
Any slope less than 1% positive. Remedial work mandatory.

Where poured concrete driveways, or substantial patios or decks were located adjacent to the house, it was recognized that heavy costs would be involved in rebuilding these structures if they did not conform to the guidelines. So they were exempted from the "upgrading" requirement. Where gaps were apparent between the home wall and an adjacent paved area of questionable slope, the homeowner was required to fill in the gap with bentonite clay.

.5 The County undertook to supply any fill material or bentonite clay that was required. The inspection form stated that the homeowner had a maximum of one year to correct deficiencies and included a telephone number for ordering the necessary materials. Labour and equipment were the responsibility of the homeowner.

Improvement work included the creation of, at least, a 3% positive slope over 1.5 metres from the wall of the house on all sides. Typical tasks consisted of:

1. adding soil to flower beds
2. removing sod and relaying it on a fill
3. top-dressing grassed areas
4. installing or adding to window wells
5. relaying paving stones or sidewalk blocks with the addition of appropriate underfill
6. applying bentonite clay to cracks or gaps between the house and poured concrete areas.
7. providing extensions to downspouts to ensure that run-off from the downspouts emerged at least 1.50 meters from the building and flowed away from the building.

The soil provided was topsoil. In the initial stages of the program, the topsoil was impregnated with clay and was difficult to work with, but a new supply was found and the quality was improved.

Homeowners completing the work were encouraged to contact the Lot Grading office for final inspection, at which time the lot grading was evaluated for conformity. The homeowner was then advised of the status of the grading, and a site meeting was arrange if further work was required.

If final inspection was not requested within two weeks of topsoil delivery, a follow-up inspection was performed at a later date. An appropriate letter indicating the status of the lot grading improvement was then left in the homeowner's mailbox.

.6 The lot grading program continued in 1988 with letters and brochures mailed directly to those homeowners who were still required to carry out lot grading improvements. The same reminder process was used in 1989 and again in 1990.

2.3 Jurisdictional Matters for Program Implementation

To facilitate entry on all lots in 1987, Strathcona County Staff were armed with a 1978 bylaw "The Sewers Bylaw", which regulated "the use of public and private sewer and drains and the disposal of sewage and the discharge of waters and waste into the Strathcona County No. 20 sewer system". A copy of this bylaw, Bylaw No. 15-78 is attached as Appendix C.

With respect to bylaw enforcement, Article 601, Part VI, "Power and Authority of Inspectors" reads as follows:

"The County and other duly authorized employees of the County bearing proper credentials and identification, shall be permitted to enter upon all properties for the purposes of inspection, observation, measurement, sampling and testing in accordance with the provisions of this Bylaw. If such inspection discloses any failure, omission or neglect to clean out such sumps, or discloses any defect in the location, construction, design or maintenance of any of the sewer system or any connection therefrom to the County system, or discloses any defect in the roof run-off collection system, **downspouts or downspout extensions of any building or the lot grade around any building which has a building sewer connected to the sanitary sewer**, the person making such inspection shall in writing notify the said owner, proprietor or occupier to rectify, at his expense, the cause of the complaint. In the event of continued noncompliance, the license to operate or use said premises shall be cancelled until such time as proper maintenance or alterations have been made, or penalties as outlined elsewhere in this Bylaw may be invoked".

This Bylaw gives authority to County inspectors to enter residential property to inspect downspouts and lot grading.

In July 1986 the County issued a Municipal Policy Handbook entitled "Lot Drainage Policy and Correction Program" (Appendix D) which describes in very clear terms the implementation of the Lot Regrading Program.

On March 3, 1987, Bylaw 10-87 was passed by Strathcona County. The Bylaw is known as "The Property Drainage Bylaw". See Appendix E. Schedule "E" of that Bylaw is titled "Lot Grading And Site Drainage Construction Standards" and sets out minimum standards for property drainage. Section 4 - "Enforcement" spells out action that can be taken by the County if a lot does not meet minimum drainage standards:

> "Where Property has not been maintained in compliance with the minimum drainage standards established pursuant to this Bylaw, the County Engineer may send a written notice by registered mail to or serve upon the owner of the Property, and all other persons shown by the records of the North Alberta Land Titles Registration Office to have an interest in the Property, and on the occupant, if any;

(a) stating that the Property does not comply with the minimum drainage standards prescribed in this Bylaw and that repairs are required to be made to it, giving reasonable particulars of the repairs required to be made;

(b) stating the time within which the repairs are to be made which shall be a minimum of two (2) months; and

(c) stating that if the repair is not so done within the terms specified, the County through its agents, employees or contractors may carry out the repairs and the cost of the work done may be levied against the Property as a debt due to the municipality or charged against the land concerned as taxes due and owing in respect of that land and to recover the costs as such".

In summary, the County Lot Grading Improvement Program was based on the Municipal Policy Handbook entitled "Lot Drainage Policy and Correction Program". Bylaws 15-78 and 10-87 provided authority for inspection and enforcement.

2.4 Participation in the Program

In 1987, 7,618 homes in Sherwood Park were inspected. The status at that time was as follows:

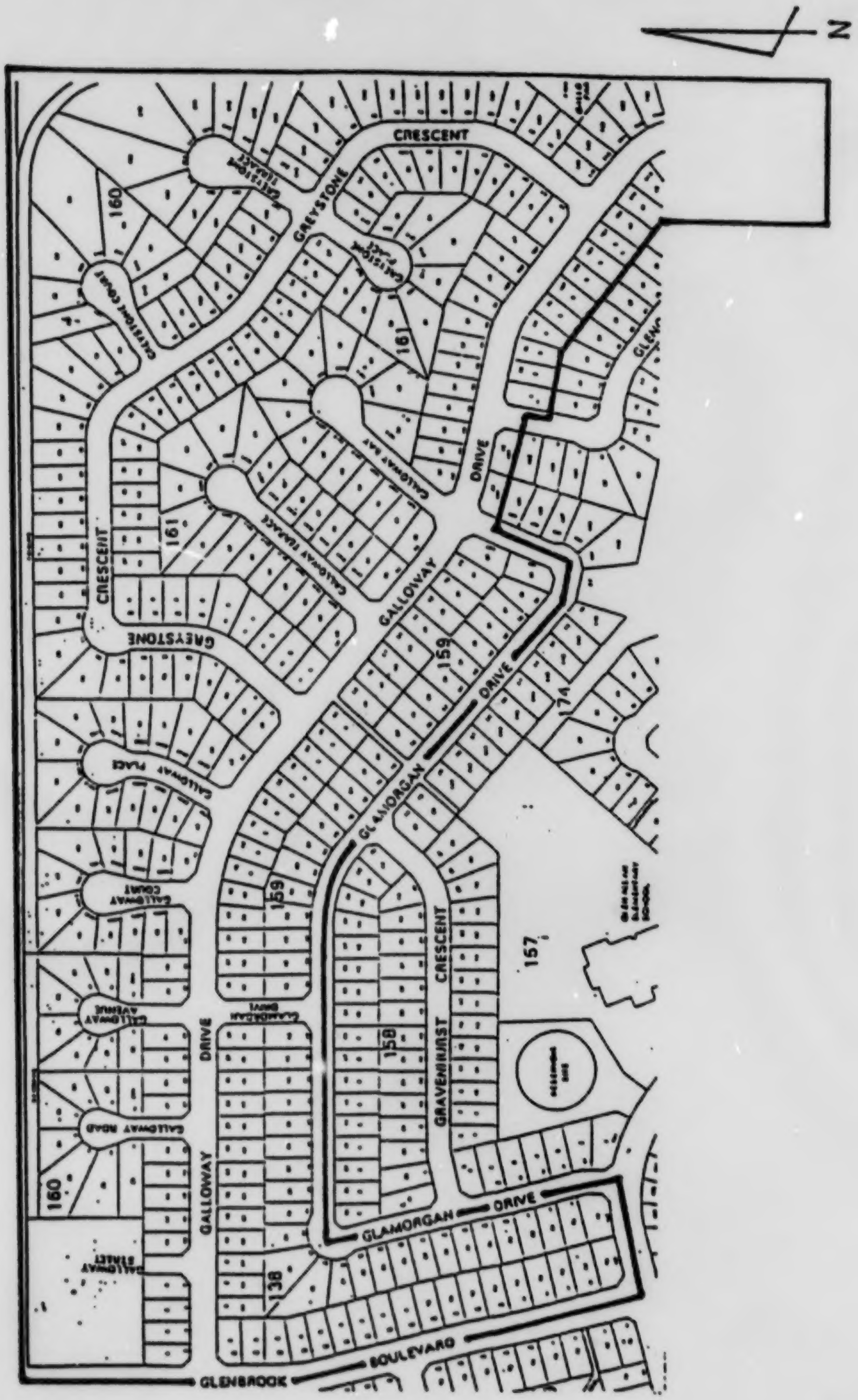
"Conformity" Status	2,792 - 36.7%
"Recommended" Status	1,986 - 26.0%
"Mandatory" Status	2,840 - 37.3%

On July 25, 1990, the status was

"Conformity" Status	6,147 - 80.6%
"Recommended" Status	911 - 12.0%
"Mandatory" Status	560 - 07.4%

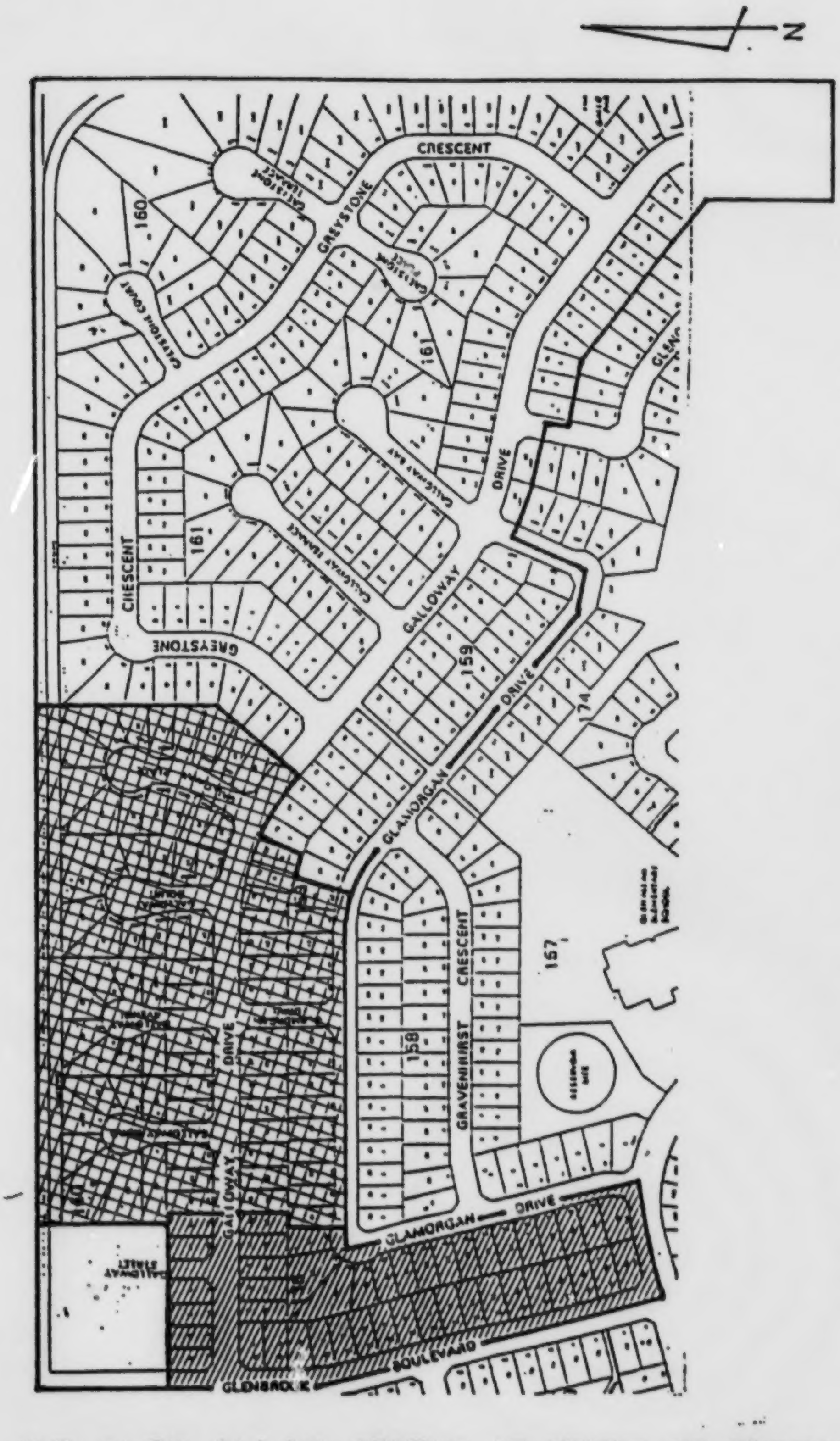
For the purposes of this study, one area of Sherwood Park was singled out for more detailed review; the N.E. corner of the Glen Allan subdivision located in N.E. 1/4 Section 35-52-23-W4. The area is shown in Figure 2.

Figure 2A is a graphical representation of the status of the lots in 1987, when the program was started. Figure 2B represents the status on August 31, 1990. The numbers and percentages relating to this area are shown in Table 1. The graphical representation is schematic and "lumps" the categories to preserve the confidential nature of this report.


N
CRESCENT
GREYSTONE
160
161
DRIVE
GALLOWAY
CRESCENT
GREYSTONE
159
DRIVE
74
GALLOWAY PLACE
GLAMORGAN
GALLOWAY COURT
159
157
CRESCENT
GALLOWAY AVENUE
DRIVE
158
GRAVENHURST
GALLOWAY ROAD
GALLOWAY
160
GLAMORGAN DRIVE
138
BOULEVARD
GLENBROOK

COUNTY REVIEW AREA -
N.E. GLEN ALLAN

FIGURE 2



N
CRESCENT
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160
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GALLOWAY BAY
GALLOWAY TERRACE
GALLOWAY DRIVE
GALLOWAY DRIVE
GLAMORGAN DRIVE
GLAMORGAN DRIVE
GRAVENHURST CRESCENT
GLEN
GLENBROOK BOULEVARD
GALLOWAY STREET

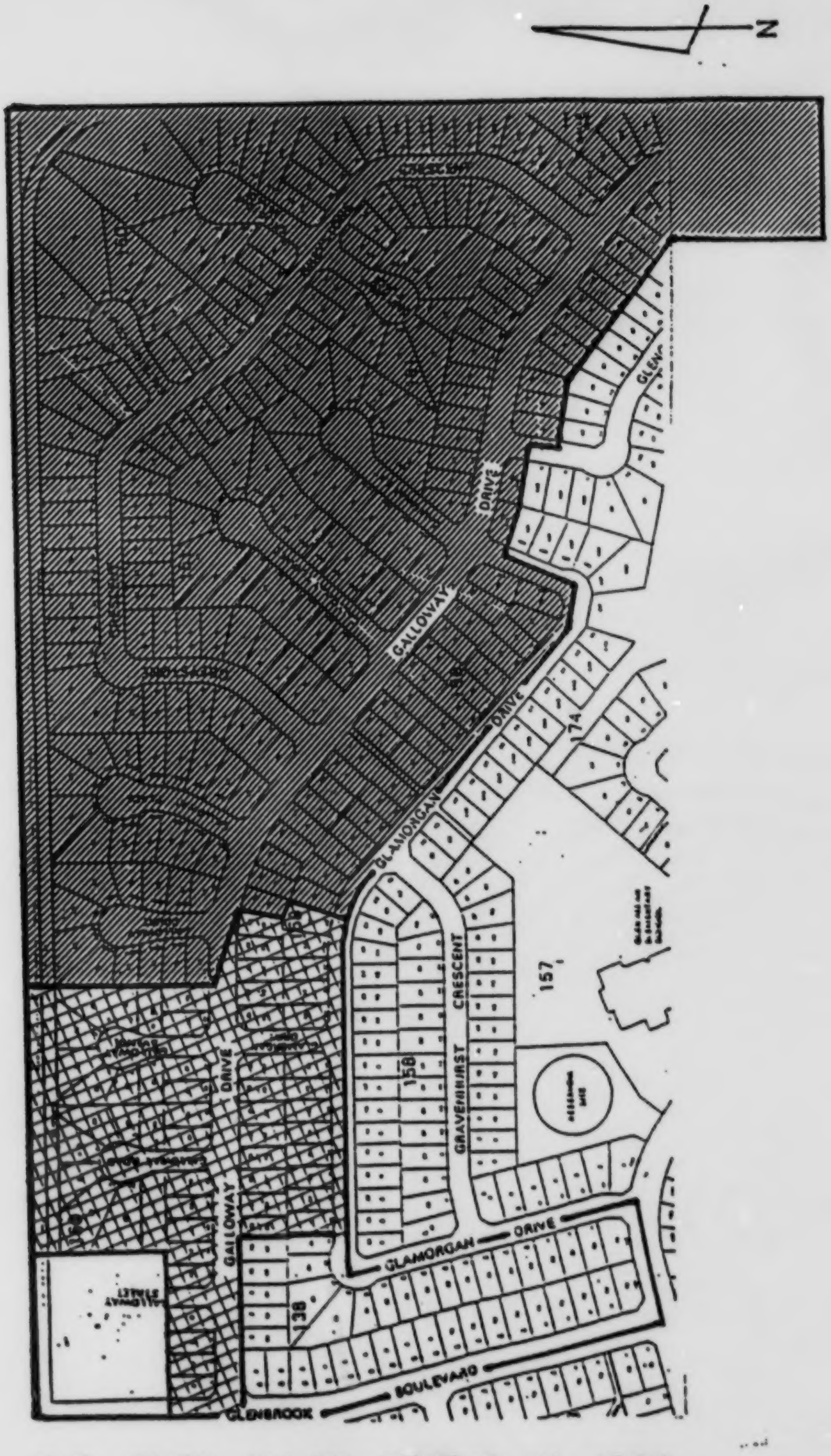
N.E. GLEN ALLAN STATUS AT START OF PROGRAM

▨ 12.5 % OR 45 LOTS CONFORMITY

▦ 22.5 % OR 81 LOTS RECOMMENDED

☐ 65.0 % OR 234 LOTS MANDATORY

FIGURE 2A


N
GALLOWAY
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GLAMORGAN
DRIVE
GLEN
74
GRAVENHURST
CRESCENT
157
158
GALLOWAY
DRIVE
GLAMORGAN
DRIVE
138
GLENBROOK
BOULEVARD

N.E. GLEN ALLAN STATUS IN 1990

▨ 73.1% OR 263 LOTS CONFORMITY

▦ 15.8% OR 57 LOTS RECOMMENDED

☐ 11.1% OR 40 LOTS MANDATORY

FIGURE 2B

TABLE 1
N.E. GLEN ALLAN
LOT GRADING STATUS 1987-90

STATUS	1987		1990	
	NO.	%	NO.	%
CONFORMITY	45	12.5	263	73.1
RECOMMENDED	81	22.5	57	15.8
MANDATORY	234	65.0	40	11.1

The foregoing numbers and percentages are a measure of the support given to the program by the general public. For N.E. Glen Allan, the participation in the program, with respect to change in "mandatory" status, is designated as

$$\frac{234 - 40}{234} \text{ X } 100 = 83\%$$

For Sherwood Park, as a whole, the participation with respect to change in "mandatory status", is

$$\frac{2,840 - 560}{2,840} \text{ X } 100 = 80.3\%$$

2.5 Costs

The following costs applied to the Strathcona County program included materials, trucking and rental of equipment, bentonite clay, summer staff salaries, advertising, printing, etc. The costs did not include the time of administrative or technical personnel in the full-time employ of Strathcona County.

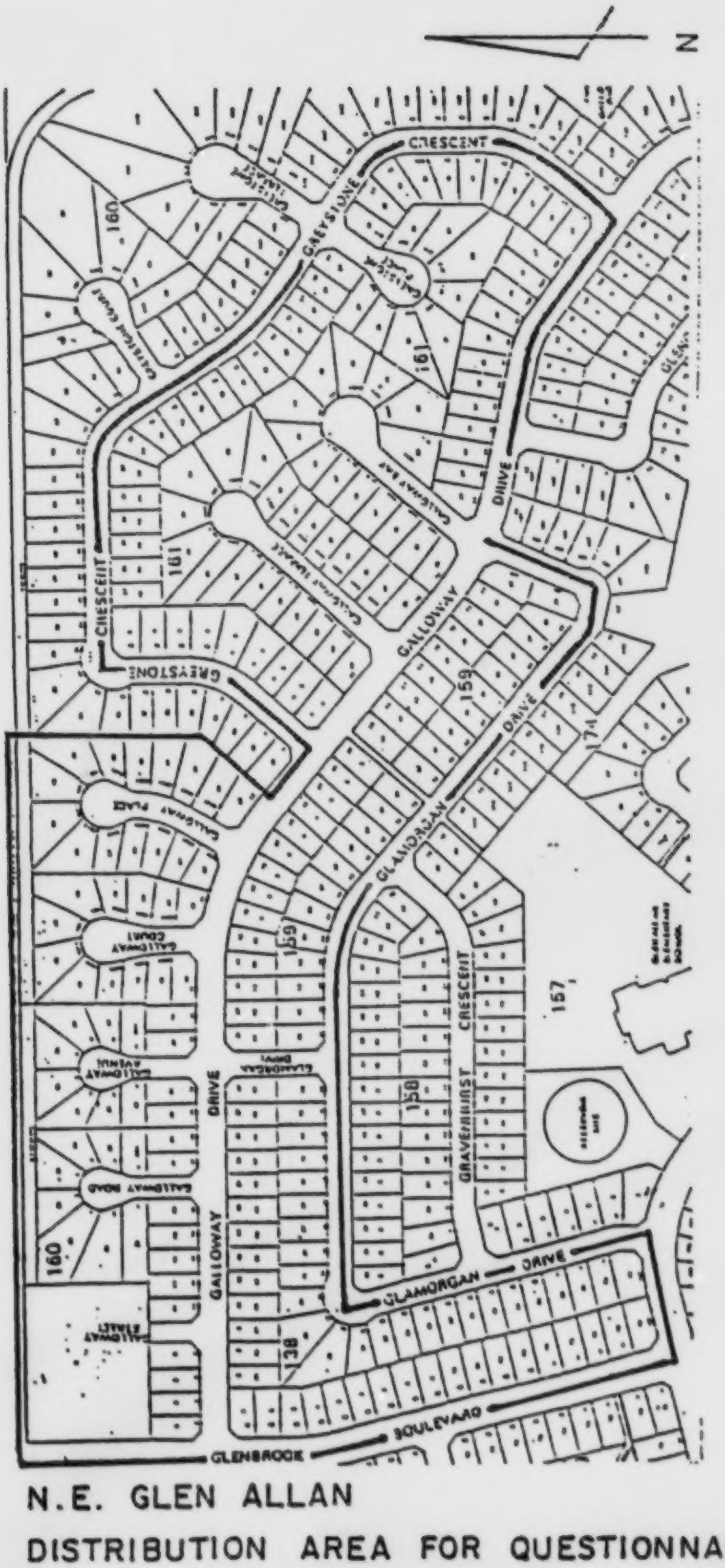
1987 -	$ 77,378.57
1988 -	65,605.51
1989 -	40,182.10
1990 -	54,635.00
TOTAL	$237,801.25

2.6 Public Acceptance

As part of this project, to gauge public acceptance, a questionnaire was prepared and distributed by hand to 252 homes situated in the N.E. corner of the Glen Allan subdivision. The area is shown in Figure 3.

The area chosen did not experience the high incidence of basement flooding that occurred in 1983. It is at a higher elevation than the lower areas in Sherwood Park, where a majority of the flooding took place. This was a deliberate choice, since it was deemed important to test the awareness and acceptance of residents who had not suffered direct damage and inconvenience.

The covering letter and questionnaire are shown in Appendix F. A summary of the responses is provided in Table 2. Eighty-Seven homeowners or 34.5% replied.


N
CRESCENT
GREYSTONE
160
161
GALLOWAY
DRIVE
CRESCENT
GREYSTONE
159
174
GLAMORGAN
DRIVE
GALLOWAY PLACE
GALLOWAY COURT
GALLOWAY AVENUE
GALLOWAY ROAD
GALLOWAY STREET
GLAMORGAN DRIVE
GRAVENHURST CRESCENT
158
157
138
160
GLAMORGAN DRIVE
GLENBROOK BOULEVARD

N.E. GLEN ALLAN

DISTRIBUTION AREA FOR QUESTIONNAIRES

FIGURE 3

TABLE 2
N.E. GLEN ALLAN
SUMMARY OF RESPONSES TO QUESTIONNAIRE

Q3 Did the Municipality inform you that your lot had to be graded?

A3 YES - 70 NO - 10 BLANK - 6 OTHER -1

Q4 How did the Municipality inform you?

A4 BLANK - 10; LETTER - 54; PHONE - 2; WORD OF MOUTH - 5; PAMPHLET - 9; OTHER - 7

Q5 What's your understanding of reasons for lot grading?

A5 BLANK - 21; PROTECT SANITARY - 21; PROTECT BASEMENT - 15; PROTECT HOUSE - 23; PROTECT STORM SYSTEM -5; PROTECT TREATMENT PLANT - 2

Q6 Did you have a problem prior to the regrading program?

A6 YES - 19 NO - 53 BLANK - 15

Q7 If so, what was it?

A7 BLANK - 70; SEEPAGE - 9; SEWER BACK-UP - 6; OTHER - 2

Q8 Was your lot regraded?

A8 YES - 60; NO - 6 BLANK 21

Q9 If it was not, why not?

A9 BLANK - 75. DIDN'T AGREE THERE WAS A PROBLEM - 2; COMMUNICATION PROBLEM - 3; OTHER - 7

Q10 If it was, who graded it?

A10 BLANK - 25; THE MUNICIPALITY - 1; OURSELVES - 60; OTHER - 1

Q11 Describe work done.

A11 BLANK - 30; LANDSCAPING - 8; GRADING AND LANDSCAPING - 49

Q12 Were you satisfied with lead up arrangements?

A12 YES - 44 NO - 9 BLANK - 34

Q13 Did the regrading work cause you problems?

A13 YES - 26 NO - 32 BLANK - 29

Q13A What were the problems?

A13A BLANK - 56; INCONVENIENCE - 16; DIRT - 9; DESTRUCTION - 5; LOSS OF PRIVACY - 1

Q14 What did the regrading work cost you?

A14 BLANK - 22; <$100 - 45; $100-200 - 13; $200-500 - 2; $500 - 1,000 - 2: > $1,000 - 3

Q15 In your opinion was the regrading necessary?

A15 YES - 38; NO - 20 BLANK - 19; DON'T KNOW - 10

Q16 In your opinion did the regrading do any good?

A16 YES - 33 NO - 20 BLANK - 17; DON'T KNOW - 17

Q17 Were you kept reasonably informed during the regrading work?

A17 YES - 35 NO - 26 BLANK - 25; OTHER - 1

Q18 Would you be willing to give further information if requested?

A18 YES - 58 NO - 13 BLANK - 14; OTHER - 2

Q19 Would you give permission for your lot to be surveyed to gather more information?

A19 YES - 58 NO - 15 BLANK - 14

Q20 Any other comments?

A20 BLANK - 60; CRITICAL - 19; SUPPORTIVE - 8

To examine public acceptance, an analysis was made of selected questions and answers.

Question 5 - What's your understanding of reasons for lot regrading?
Given that complete understanding is not necessary for an efficient lot grading program, the percentage for "general" understanding, discounting blanks and treating "Protect storm sewer" as non-understanding, is 92.4%. This can be looked upon as being a measure of the effectiveness of the municipality in making the homeowners aware of the reasons for lot regrading.

Questions 15 and 16 - Was the regrading necessary and did it do any good?
20 persons or 23% answered negatively. This would indicate that the public acceptance percent was 77%.

Questions 12 and 17 - Were you satisfied with lead-up arrangements?
- Were you kept reasonably informed during the regrading work?
83% of the respondents were satisfied with the lead-up work.
57% of the respondents said they were kept reasonably informed during the grading work

Questions 18 & 19 - Would you be willing to give further information if required?
- Would you give permission for your lot to be surveyed to gather more information?
The average response of 67% was "yes".

Question 20 - Any other comments?

27 of the 87 respondents had comments. A selection of comments follows:

a. "Our lot did not require regrading due to the fact that we did not incur basement flooding since we moved into our house in 1978."

b. "The quality of the soil provided was terrible."

c. "During change of ownership, County could do more to inform new owners of status of property, regrading etc."

d. "I am satisfied with my lot."

e. "We have learned to live with our basement leaks as proper repairs would be very expensive."

f. "It is excellent that County inspectors visit and let people know how to protect the property."

g. "I believe that the results would be a lot more accurate and meaningful if this would have been conducted three years ago."

h. "When the subdivisions were laid out, proper drainage was present on the lots. However, through individuals landscaping, settling of the soil and such our lot ended up having the majority of surrounding properties draining into it.

i. "In our view the County of Strathcona was too lenient with previous owners of this property and should have leaned on them more heavily to carry out the necessary regrading.

j. "The survey people were courteous and accurate with the time they said dirt would arrive."

2.7 Lot Grading Survey

A description of the lot grading survey done in conjunction with this report is given in Appendix N.

Thirty one single family lots were surveyed. The survey determined the percentage of area that drained away from the house and this percentage was designated as "Lot Grade Efficiency". The results are tabulated in Table 3, "County Lot Grade Efficiencies".

The existing average Lot Grade Efficiency for the 31 lots is 79.5%. The survey shows that this Lot Grade Efficiency could be raised to 84.2% if roof drain run-offs were installed according to existing standards.

TABLE 3 - COUNTY LOT GRADE EFFICIENCIES

31 LOTS IN GLEN ALLAN, SHERWOOD PARK

	NUMBER OF LOTS SURVEYED	MEAN LOT GRADE EFFICIENCY %
ORIGINALLY APPROVED LOTS	3	77.4
COMDEMNED LOTS-NOT RECTIFIED	5	78.5
CONDEMNED LOTS-RECTIFIED	23	79.9
CONDEMNED LOTS-RECTIFIED ROOF DRAINS PROPERTY INSTALLED	23	84.9
ALL 31 LOTS	31	79.5
ALL 31 LOTS WITH ROOF DRAINS PROPERLY INSTALLED	31	84.2

2.8 Measurement of Effectiveness of Program

The measurement of effectiveness of the program could be done by comparing flow records in the sanitary sewer system before and after the implementation of the program. However, the Strathcona County has no such records, and whatever information the Capital Region Sewage Commission has is sketchy, intermittent and subject to flows from areas outside Sherwood Park. The perceived effectiveness of the program will be discussed in Section 4.7 of this report.

3.0 CITY OF EDMONTON LOT REGRADING PROGRAM

3.1 Introduction

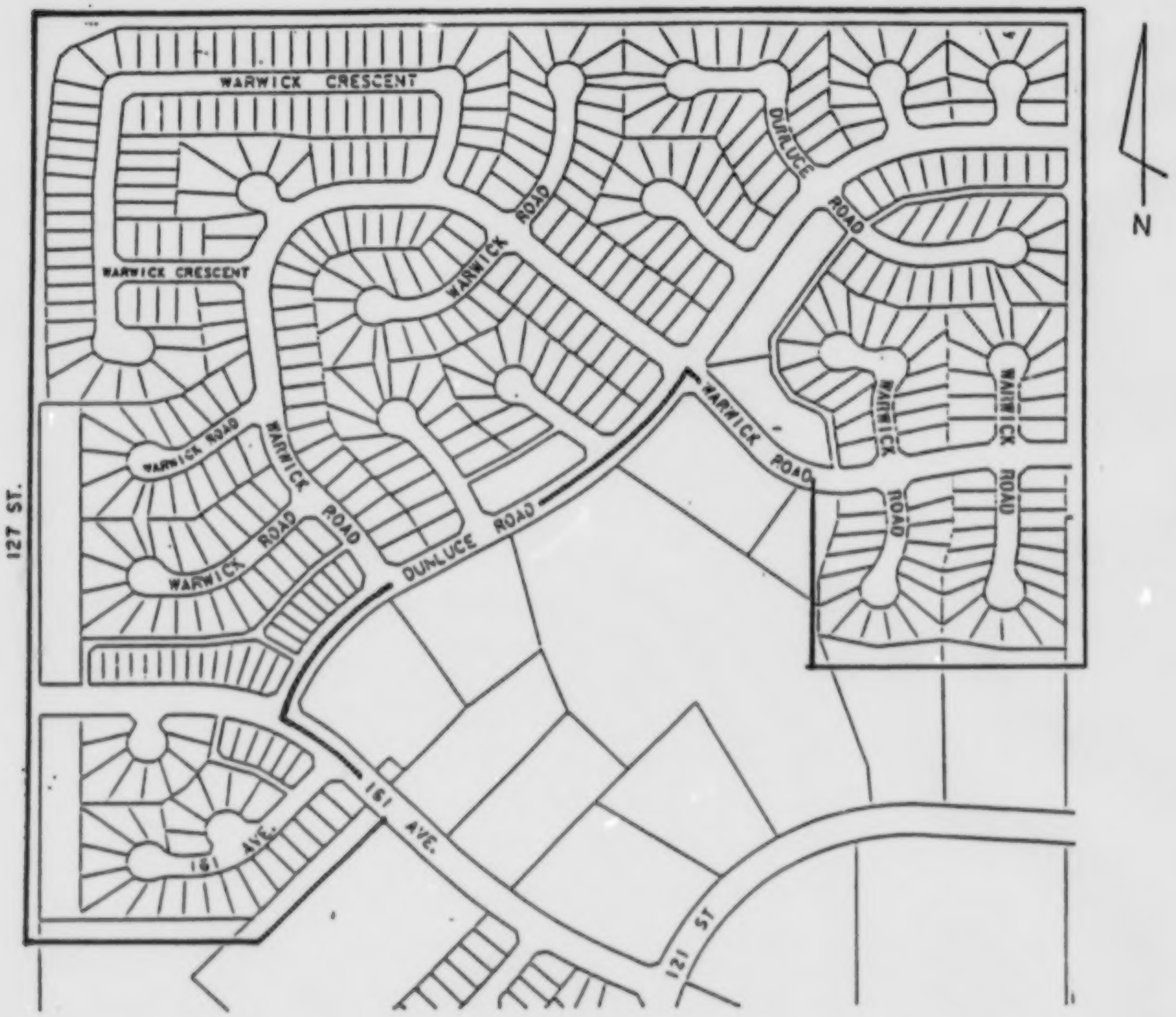
In July 1986, heavy rainstorms caused sanitary sewers to back up into basements in the Dunluce/Warwick and Lago-Lindo subdivisons in Edmonton. Refer to Figure 1, page 9, for the locations of these subdivisions. Subsequently, on July 31, 1987 and September 2 and 3, 1987 rainstorms caused more flooding in those areas.

A consulting engineering company, CH2M Hill Engineering Ltd., was hired by the City of Edmonton in the fall of 1987 to investigate the causes of flooding in Lago-Lindo and Dunluce/Warwick and to propose remedies.

The investigation included a visual survey of all lots in both subdivisions to examine lot grading and the status of downspouts. The lot review areas are shown on Figures 4 and 5.

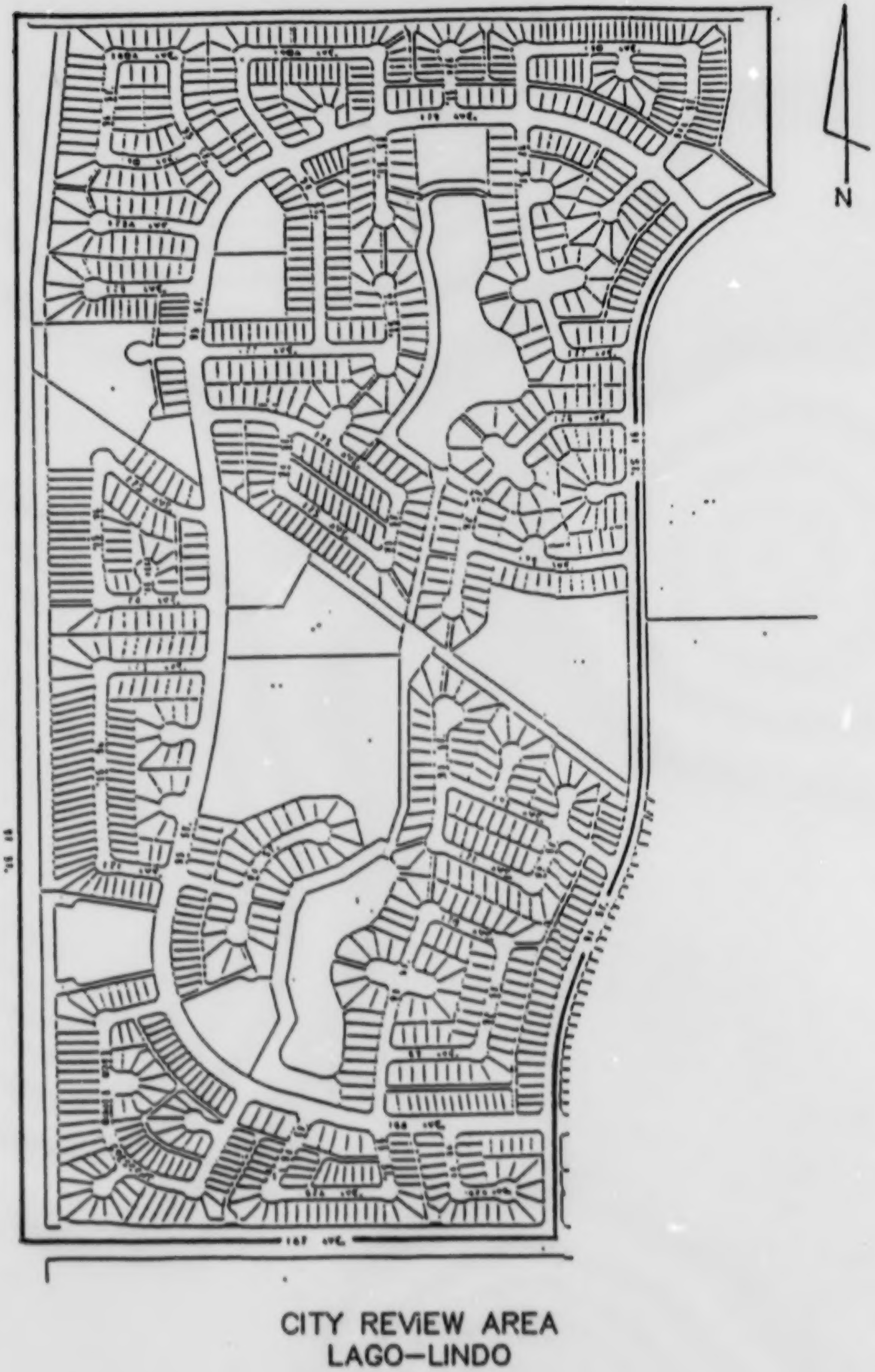
The Edmonton City Council placed a high priority on mitigating flooding of basements in Dunluce/Warwick and Lago-Lindo; the City Drainage Branch and CH2M Hill, commenced a comprehensive public communication and action program in May 1988.

More flooding during July 5/6, 1988 lent urgency to the investigations and reports, and a more detailed lot review was carried out in August and September 1988.


WARWICK CRESCENT
WARWICK CRESCENT
DUNLUCE
ROAD
WARWICK ROAD
WARWICK
WARWICK ROAD
WARWICK ROAD
WARWICK ROAD
WARWICK ROAD
WARWICK ROAD
WARWICK ROAD
DUNLUCE ROAD
127 ST.
161 AVE.
161 AVE.
121 ST
N

CITY REVIEW AREA -
DUNLUCE/WARWICK

FIGURE 4



CITY REVIEW AREA
LAGO—LINDO

FIGURE 5

3.2 Description of the Program

In May 1988, a letter was sent by the City to all householders in the Dunluce/Warwick and Lago-Lindo areas (Appendix G). The letter gave information on the lot regrading program. Based on previous surveys, lots with grading deficiencies were identified, and those owners were invited to inform the City of their interest in the program.

The lots had been evaluated on the basis of "no ponding" on the lot within 2.0 metres around the house. The method of evaluation was visual, except that a surveyor's level was used in doubtful cases. After the inspection, each lot was designated "conforming" or "non-conforming."

Interested homeowners were provided with a Lot Regrading Agreement for their signature, together with Schedules 1 and 2, (Appendix H) which described the work to be done in written and in graphical form.

The work generally consisted of the following tasks;

1. Removing and replacing sod, placing fill material, raising planters, adjusting concrete sidewalk blocks, constructing wooden retaining structures, and extending window wells.
2. Excavation, including removal and replacement of sod, levelling high points or constructing swales.

In 1988, CH2M Hill supervised and co-ordinated the construction work for lot regrading which was carried out by the Mennonite Central Committee (MCC).

A detailed account of the 1988 lot regrading work is given in Technical Memorandum No. 10 which is part of the CH2M Hill report entitled,
"FINAL REPORT
Dunluce/Warwick and Lago-Lindo
Sanitary Sewer Rehabilitation
Phase I
1989 April."

The Technical Memorandum is included in Appendix I.

The additional flooding of July 5/6, 1988 led to a more detailed lot review in August and September 1988.

In 1989, City of Edmonton staff took over the coordination and management of the regrading program and continued to utilize the Mennonite Central Committee as the Contractor. The 1989 program started with the delivery of a letter (Appendix J) to householders in Dunluce/Warwick and Lago-Lindo who had deficient lots but had not yet availed themselves of the lot regrading program. Documentation and procedures were similar to those of the 1988 program.

The number of lots rectified in 1988 was 276. In 1989, 85 lots were rectified.

Appendix K shows examples of pamphlets distributed by the City of Edmonton and reproduced in local newspapers describing the sewerage system and providing advice on keeping basements dry.

3.3 Jurisdictional Matters for Program Implementation

By-Law No. 9198, the Minimum Property Standards By-Law City of Edmonton, (Appendix L) sets various standards for the maintenance and occupancy of property. Article 5 of Bylaw No. 9198 is entitled "RIGHT OF ENTRY" and reads,

> "(a) An Inspector may only enter land or a building if:
>
> (i) The owner or person in possession of it gives his consent to the entry, or
>
> (ii) The entry is authorized by an Order of the Court of Queen's Bench pursuant to Subsection (b) and then only for the purposes of insuring compliance with this Bylaw----".

The Bylaw, in Subsections (b) and (c), goes on to describe the circumstances in which an Order of the Court of Queen's Bench may be obtained.

Part II of Bylaw 9198 is titled "STANDARDS" and Article 8 pertains to "DRAINAGE." Article 8 reads,

> "(a) No roof drainage shall be discharged on sidewalks, stairs or neighboring property.
>
> (b) All lots shall be maintained such that water will not accumulate at or near a building.
>
> (c) All roof drainage down spouts which are not connected to a sewer shall be maintained such that soil erosion is prevented".

Article 6 of Bylaw 9198 is titled "ENFORCEMENT" and describes notices to persons not complying with the standards and also specifies penalties for non-compliance.

3.4 Participation in the Program

In 1988, 1,674 lots in Dunluce/Warwick and Lago-Lindo were inspected. The status at that time was as follows:

Lots conforming	457	27.3%
Lot not conforming	1,217	72.7%

Figures 4A and 5A are graphical representations of the conformity status in 1988 at the beginning of the program for each area.

In 1990, the status was

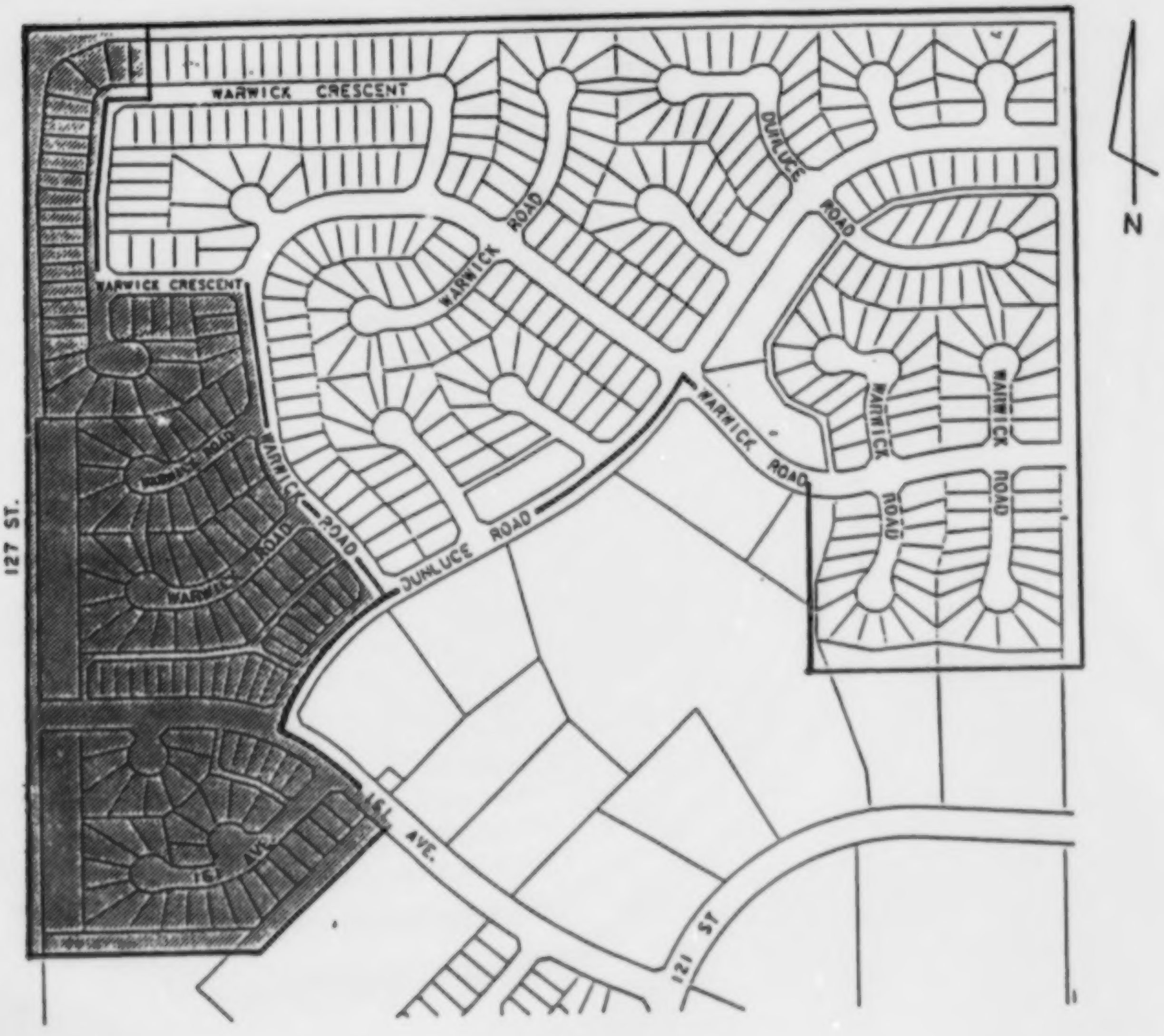
Lots conforming	848	50.7%
Lots not conforming	826	49.3%

Figures 4B and 5B are graphical representations of the conformity status in 1990 for each area.

The graphical representations are schematic and "lump" the categories to preserve the confidential nature of this report.

From the foregoing numbers, the participation in the program with respect to change in "Lots not conforming" can be computed as

$$\frac{1,217 - 826}{1,217} = 32.1\%$$


WARWICK CRESCENT
WARWICK CRESCENT
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DUNLUCE ROAD
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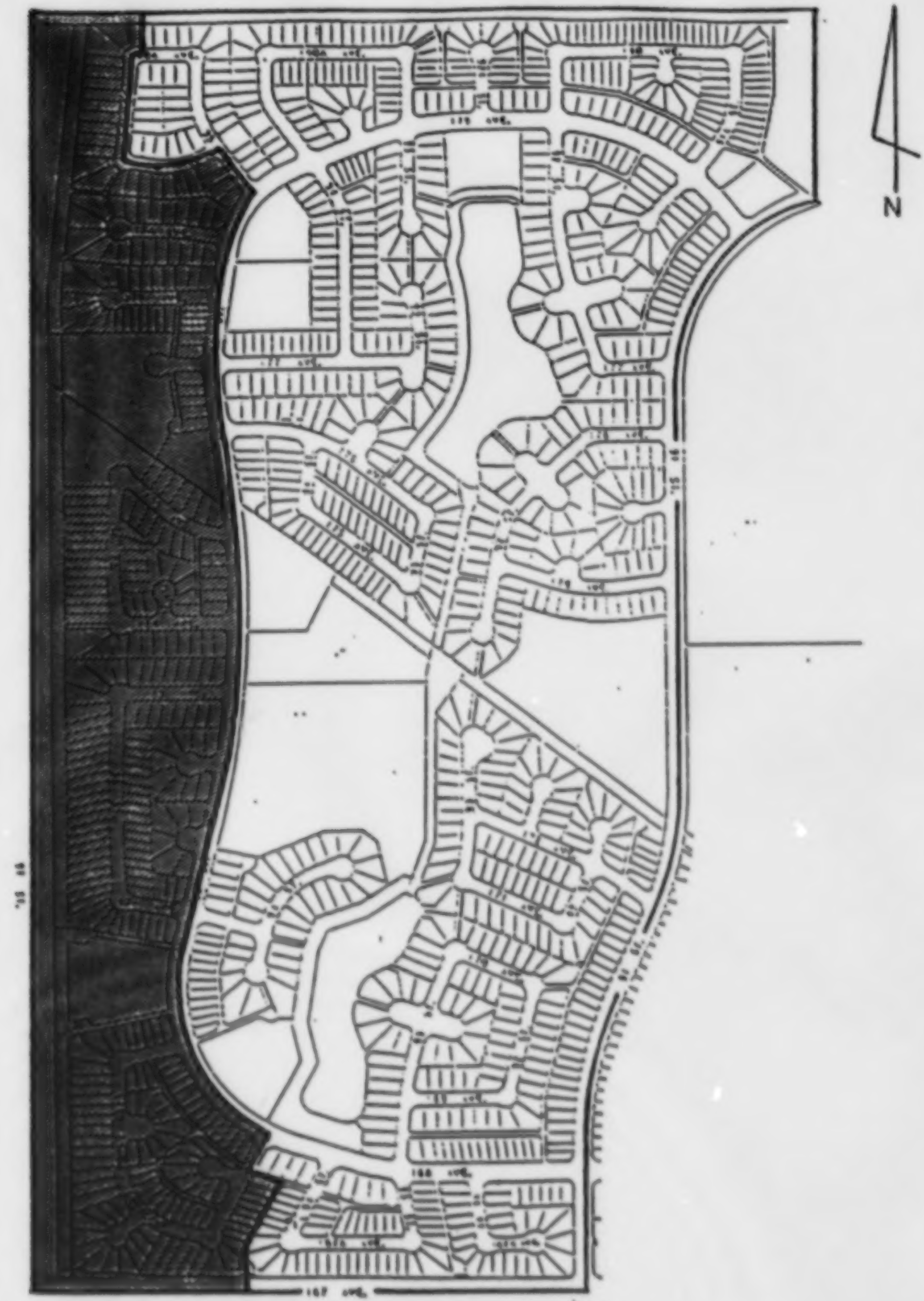
ROAD
WARWICK ROAD
WARWICK ROAD
DUNLUCE ROAD
WARWICK ROAD
127 ST.
161 AVE.
161 AVE.
121 ST
N

DUNLUCE/WARWICK
STATUS AT START OF PROGRAM

▨ 29.0% OR 133 LOTS CONFORMING

☐ 71.0% OR 327 LOTS NON-CONFORMING

FIGURE 4A

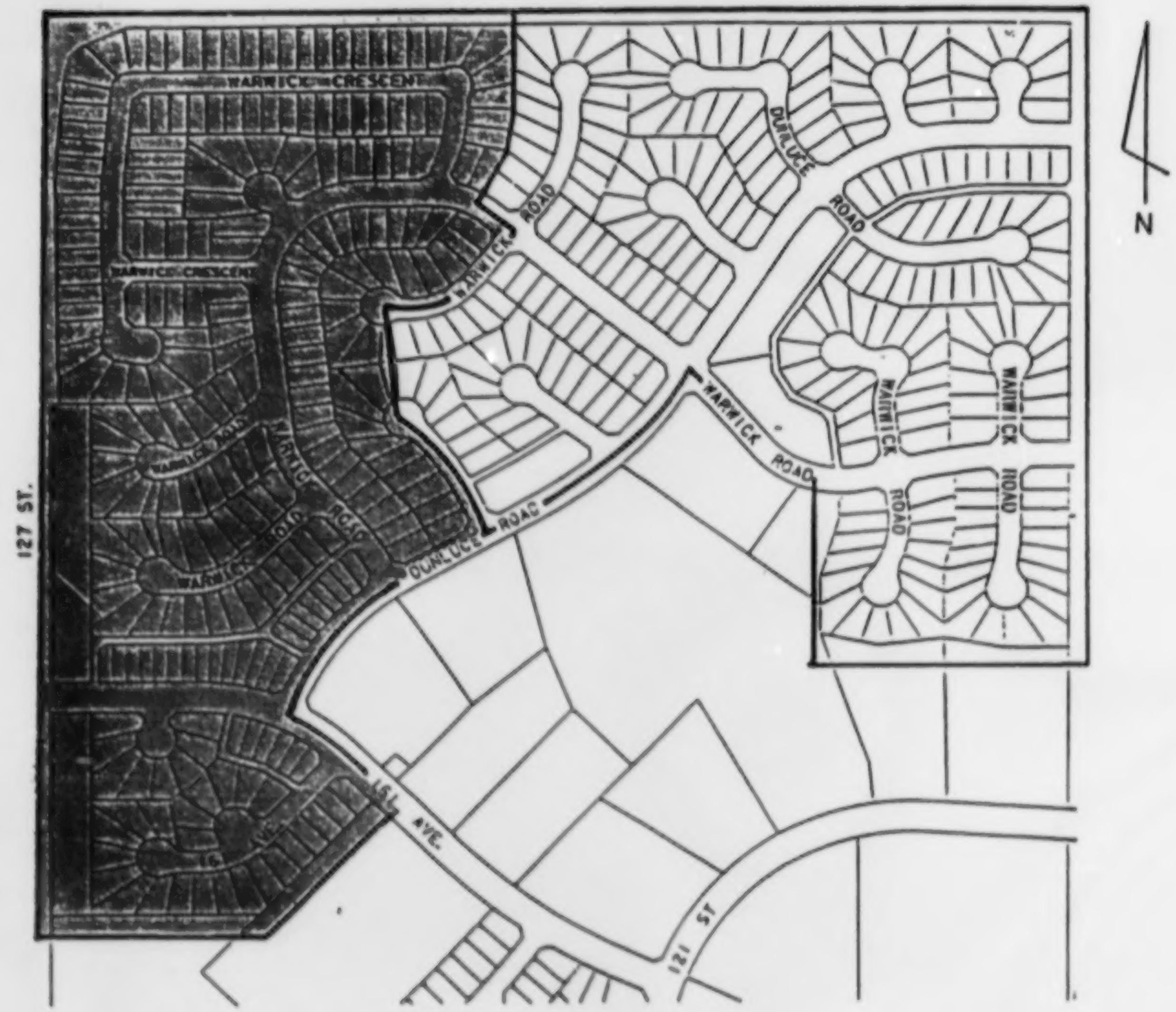


LAGO—LINDO
STATUS AT START OF PROGRAM

■ 26.7% OR 324 LOTS CONFORMING

☐ 73.3% OR 890 LOTS NON-CONFORMING

FIGURE 5A

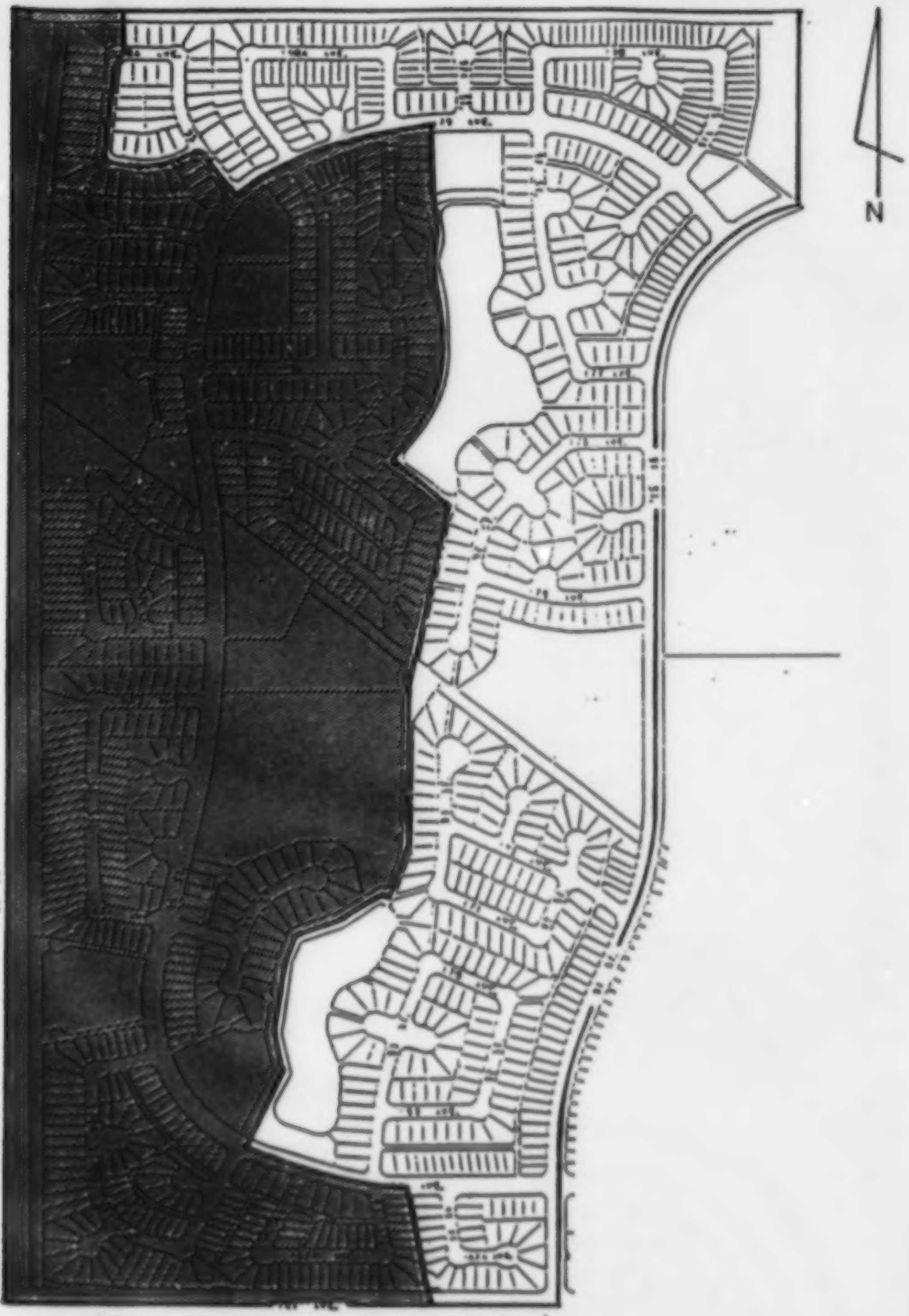

WARWICK CRESCENT
WARWICK CRESCENT
WARWICK ROAD
WARWICK ROAD
WARWICK ROAD
WARWICK ROAD
WARWICK ROAD
WARWICK ROAD
DUNLUCE ROAD
DUNLUCE ROAD
161 AVE.
121 ST
127 ST.
N

DUNLUCE/WARWICK
STATUS IN 1990

▨ 52.4% OR 241 LOTS CONFORMING

☐ 47.6% OR 219 LOTS NON-CONFORMING

FIGURE 4B



LAGO–LINDO
STATUS IN 1990

■ 50% OR 607 LOTS CONFORMING

☐ 50% OR 607 LOTS NON-CONFORMING

FIGURE 58

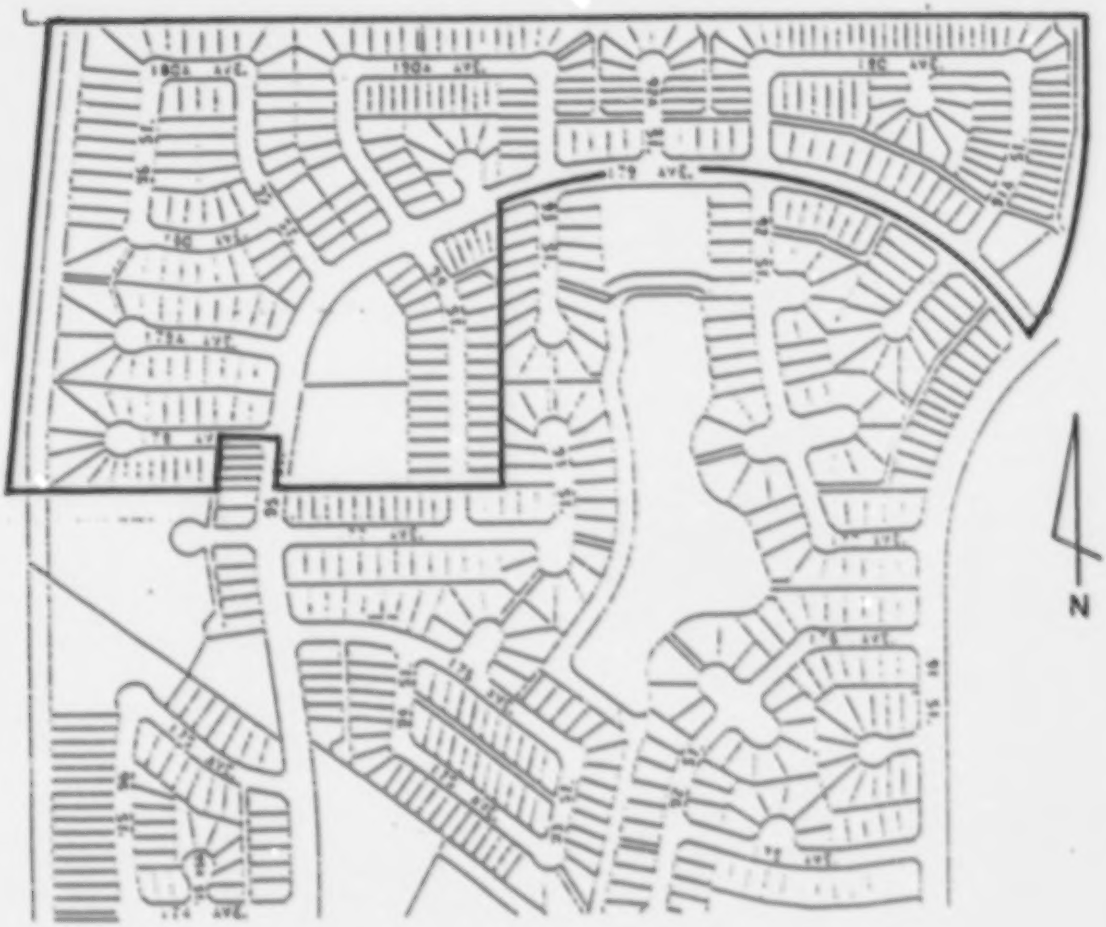
3.5 Costs (City)

From CH2M Hill's Technical Memorandum No. 10, the cost for regrading work on 287 lots was $383,442.85 This is equivalent to $1,336.04 per lot. These costs do not include the time of administrative or technical personnel of CH2M Hill or the City of Edmonton. A Federal Government Funding Program was available for job training of new immigrants. The Mennonite Central Committee availed themselves of this by hiring immigrants who could be admitted to the Program.

3.6 Public Acceptance (City)

As part of this report, to investigate public acceptance, a questionnaire was prepared and distributed by hand to 286 homes in Lago-Lindo. The area is shown in Figure 6. The area was chosen because of its relatively high elevation compared to other areas in Lago-Lindo; it experienced very little, if any, sanitary back-up into basements from 1986 to 1988 inclusive. This was a deliberate choice, since it was considered important to test the awareness of residents who had not suffered direct damage and inconvenience.

The covering letter and questionnaire are shown in Appendix M. A summary of the responses is provided in Table 4. Sixty homeowners or 21% replied.



LAGO—LINDO
DISTRIBUTION AREA FOR QUESTIONNAIRES

FIGURE 6

TABLE 4
DUNLUCE/WARWICK AND LAGO-LINDO
SUMMARY OF RESPONSES TO QUESTIONNAIRE
CITY OF EDMONTON

Q4 Did the City of Edmonton inform you that your lot had to be regraded?

A4 YES - 19 NO - 34 BLANK - 7

Q5 How did the City inform you?

A5 BLANK - 35; LETTER - 17; PHONE - 0; WORD OF MOUTH - 4; PAMPHLET - 4

Q6 What is your understanding of reasons for lot regrading?

A6 BLANK - 21; PROTECT SANITARY - 2; PROTECT BASEMENT - 11; PROTECT HOUSE - 14; PROTECT STORM SYSTEM -6; OTHERS - 6

Q7 Did you have a problem prior to the regrading program?

A7 YES - 8 NO - 34 BLANK - 18

Q8 If so, what was it?

A8 BLANK - 53; SEEPAGE - 2; SEWER BACK-UP - 1; OTHER - 4

Q9 Was your lot regraded?

A9 YES - 15; NO - 18 BLANK - 20

Q10 If it was not, why not?

A10 BLANK - 47. DIDN'T AGREE THERE WAS A PROBLEM - 5; COMMUNICATION PROBLEM - 3; OTHER - 5

Q11 If it was, who graded it?

A11 BLANK - 40; CH2M HILL-MENNONITES - 5; CITY OF EDMONTON - 5; OTHERS - 2; OURSELVES - 8

Q12 Describe work done.

A12 BLANK - 42; LANDSCAPING - 2; GRADING AND LANDSCAPING - 16

Q13 Were you satisfied with lead up arrangements?

A13 YES - 10 NO - 7 BLANK - 43

Q14 Did the regrading work cause you problems?

A14 YES - 6 NO - 18 BLANK - 36

Q14A What were the problems?

A14A BLANK - 49; INCONVENIENCE - 8; DIRT - 1; DESTRUCTION - 2; LOSS OF PRIVACY - 0

Q15 What did the regrading work cost you?

A15 BLANK - 40; <$100 - 3; $100-200 - 11; $200-500 - 4; $500 - 1,000 - 1: > $1,000 - 1

Q16 In your opinion was the regrading necessary?

A16 YES - 23; NO - 4 BLANK - 31; DON'T KNOW - 2

Q17 In your opinion did the regrading do any good?

A17 YES - 17 NO - 3 BLANK - 34; DON'T KNOW - 6

Q18 Were you kept reasonably informed during the regrading work?

A18 YES - 14 NO - 9 BLANK - 33; OTHER - 4

Q19 Would you be willing to give further information if requested?

A19 YES - 38 NO - 2 BLANK - 20

Q20 Would you give permission for your lot to be surveyed to gather more information?

A20 YES - 38 NO - 6 BLANK - 16

Q21 Any other comments?

A21 NO - 2; BLANK - 37; CRITICAL - 16; SUPPORTIVE - 5

To examine Public Acceptance, an analysis was made of selected questions and answers.

Question 6 - What is your understanding of reasons for lot regrading?

Given that complete understanding is not necessary for an efficient lot grading program, the percentage for "general understanding", discounting blanks and treating "Protect storm sewer" as non-understanding, is 84.6%. This can be looked on as being a measure of the effectiveness of the municipality in making homeowners aware of the reasons for lot regrading.

Questions 16 and 17 - Was the Regrading necessary and did it do any good? 17% of the respondents answered negatively. This indicates an 83% acceptance.

Questions 13 and 18 - Were you satisfied with lead-up arrangements?

- Were you kept reasonably informed during the regrading work?

59% of the respondents were satisfied with the lead-up work.
61% of the respondents said they were kept reasonably informed during the grading work.

Question 21 - Any other comments?
21 of the 60 respondents had comments. A selection of comments follows:

a. "If the City and its contractors would plan better and provide adequate storm systems we wouldn't have all these problems."
b. "Never experienced any problem with a flooded basement. I installed plug in basement drain as a precaution."
c. "It would appear that developers and builders should be responsible to grade all lots in relation to the other lots in the area."
d. "I believe the communications concerning lot regrading was very poor. The City could have asked homeowners not to do any landscaping until lot surveys were completed."
e. "I am pleased to see a follow up such as your questionnaire."
f. "Perhaps the City should focus on prevention and properly fixing problems."
g. "The City should enforce proper backfilling procedures around foundations. The present method being done now will keep on settling for at least 10 years."
h. "I feel there never was or is any problem with my lot or building."

3.7 Lot Grading Survey

A description of the lot grading survey done in conjunction with this report is given in Appendix N. Thirty two lots were surveyed in Lago-Lindo: 17 RF1 (normal single family) and 15 RPL (zero lot line). As with the County of Strathcona surveys the "Lot Grade Efficiency" is defined as the percentage of the lot area draining away from the house. The results are tabulated in Table 5 "City Lot Grade Efficiencies".

Proper installation of roof drains will improve the mean lot grade efficiency. Table 5 suggests that RPL lot grade efficiencies were worsened by the Lot Regrading Program. This anomally will be discussed in Section 4.6, Analysis of Lot Grading Surveys.

3.8 Measurement of Effectiveness of Program

There is no flow data available at this time that can give a measurement of the effectiveness of the program. Even if flow data were available, it would be compromised by the fact that, in conjunction with the lot regrading program, the City also installed an increased number of catch-basins in sag locations, thus decreasing the amount of storm inflow through manhole lids. The perceived effectiveness of the program will be discussed in Section 4.7 of this report.

TABLE 5 - CITY LOT GRADE EFFICIENCIES

32 LOTS IN LAGO-LINDO, CITY OF EDMONTON

	RF1 SINGLE FAMILY		RPL SINGLE FAMILY (ZERO LOT LINE)	
	NUMBER OF LOTS SURVEYED	MEAN LOT GRADE EFFICIENCY %	NUMBER OF LOTS SURVEYED	MEAN LOT GRADE EFFICIENCY %
ORIGINALLY APPROVED LOTS	4	84.0	0	N/A
COMDEMNED LOTS-NOT RECTIFIED	5	66.7	6	75.8
CONDEMNED LOTS-RECTIFIED	4	74.0	6	69.3
CONDEMNED LOTS-RECTIFIED ROOF DRAINS PROPERTY INSTALLED	4	74.0	6	81.8
ALL 32 LOTS	17	72.3	15	68.7
ALL 32 LOTS WITH ROOF DRAINS PROPERLY INSTALLED	17	80.6	15	81.0

4.0 ANALYSIS

4.1 Introduction

A direct comparison between the programs carried out by the City of Edmonton and Strathcona County is not possible because of basic differences relating to time, circumstances and expediency:

.1 The City of Edmonton lot regrading program was initiated in 1988 as a reaction to severe flooding that took place in Dunluce/Warwick and Lago-Lindo in July 1986 and 1987. The work was carried out in conjunction with a sanitary sewer upgrading program, which had the same aim as the lot regrading program; namely protection of basements from flooding.

The seriousness of the situation was emphasized in July 1988 when more flooding struck the area at a time when the regrading program was in progress.

Thus the Edmonton program was carried out in a near-crisis atmosphere and, for that reason, it should not be compared directly with the Strathcona County program.

.2 The Strathcona County experience started with sanitary sewer flooding during rainstorms in 1983. In 1985, the County increased the capacity of the sanitary sewer system to convey infiltrating stormwater and this provided protection against further basement flooding. Then, in 1987, to control heavy flows to the Sewage Treatment Plant, the County implemented the lot regrading program which is still in action. This program has been carried out without the sense of urgency applied to the Edmonton program and without the intense political pressure that was brought to bear, from time to time, on the Edmonton program.

The ensuing analysis is an examination of components of the restrictive programs, with the intent of integrating worthwhile elements into recommended procedures for future lot regrading schemes.

4.2 Program Analysis

4.2.1 Information Dissemination

.1 An example of a City of Edmonton public information pamphlet is shown in Appendix K. It was also featured as a full page advertisement in the local press. The title is "Keep Your Basement Dry This Summer." "Keep Your Neighbour's Basement Dry This Summer" would have been a more telling and appropriate title.

The technical parts of the City Brochure regarding Downspout Drainage, Lot Grading and Backflow Valve are well written. However the illustrations could show more of the relationship between the house as a recognizable entity and the lot grading. The "Keep Your Basement Dry This Summer" brochure does not illustrate the weeping tile system; nor does it differentiate between storm and sanitary sewerage.

The "Follow-The-Flow" pamphlet (page K3) is well written. The illustration of the plumbing is excellent. However the "improper" and "proper" lot grading should have been exaggerated to show the major differences.

Each pamphlet conveyed its own message. However, for future lot regrading programs a combination of the two pamphlets could be effective; a combination that combines the quasi-humorous approach of the first pamphlet with the factual dissertation of the second pamphlet.

The answers to the questionnaire (page 42) can be examined to determine the effectiveness of information dissemination. Of twenty-four respondents to the question, "How did the City inform you?",
17 said "by letter"
4 said "by word of mouth"
and 4 said "by pamphlet".

From that, it seems that the direct mail approach is the most effective.

.2 Examples of Strathcona County newspaper advertisements are shown in Appendix B. The advertisements were carried by the Sherwood Park News in 1987.

The "Downspouts Extensions-Roof Drainage" advertisement showed a graphical and inaccurate representation of weeping tile drain which was not mentioned in the text. This could certainly be puzzling to the layman. The "Roof and Lot Drainage Systems" advertisement should probably have shown a bad lot grading situation and should certainly have shown the layout of the weeping tile system.

In the "Lot Grading Evaluation by the Homeowner" advertisement, the statement is made,

> "Bylaw No. 10-87 states that a positive slope between 5% and 10% must exist within the first 1.5m (5 feet) from the wall of the house."

Schedule E, "Lot Grading and Site Drainage Construction Standards," which is attached to Bylaw No. 10-87 requires 10% to be the minimum slope within 1.5 metres adjacent to the building. This sort of contradiction could lead to confusion.

Note that this advertisement advises that concrete driveways, patios and sidewalks do not require to be regraded.

In general, newspaper advertisements did not seem to be as effective in informing the public as letters and pamphlets delivered to individual households. The more site specific the information, the more it was recognized.

4.2.2 Strategy

In Edmonton in 1988, the lot regrading program was a small portion of a program which included providing larger sanitary sewers and storage facilities for high sanitary flows during storm events. The $17 million construction program for larger pipe and storage facilities was given a high priority status. On the other hand, the lot regrading program, while it was still looked upon as being essential, did not receive so much scheduling pressure because the immediate problem was being solved by the $17 million program.

The lot regrading program, Dunluce/Warwick and Lago-Lindo, relied on voluntary participation and, when the program started, the originators were not sure how many lots would be involved. So the decision was made to carry out the program for one year and then to formulate future policy from that point. The goal of the program was to act as quickly as homeowners responded to the notices regarding required work.

The strategy for this program was practical and realistic. With respect to lot grading, the City of Edmonton was in the fortunate position of implementing a program which did not have externally imposed time limits. It took advantage of available Federal Government funds and also combined low-cost labour with a training program for immigrants. The strategy did not impose on itself a rigid schedule and it gave the City of Edmonton scope for innovative changes as opportunities arose. The process, as documented in CH2M Hill's Technical Memorandum No. 10, provides valuable information for future programs of a similar type.

The Strathcona County sanitary sewer relief program, implemented in 1985, enabled its regrading program to proceed at a reasonable pace. Unlike the Edmonton program, that of the County covered a whole municipality, was not considered voluntary and a complete schedule was set at the very beginning; two months for lot inspections, and three years for the implementation of the rest of the program.

Both the City and County programs were initiated without any clear perception where they would lead. They were "first-of-a-kind" and each municipality demonstrated adaptability as each program proceeded.

4.2.3 Implementation

The construction program in Edmonton, was carried out in an expeditious and consistent manner by personnel trained for the work. CH2M Hill's Technical Memorandum No. 10 provides a detailed account. The work appears to have been adequately done in a uniform manner. It was necessary to handle the lead-up work with tact and discretion because the homeowner, whose lot needed regrading, was required to pay an average of $200. Of the 277 lots that were regraded by the Mennonite

Central Committee (MCC) in 1988, only 5 (2%) of the homeowners refused to sign the acceptance forms.

The Strathcona County program, though different from the City's, was also carried out proficiently. The students who were hired to inspect the lots received a course of preliminary training. However, it would be preferable to have lot inspections carried out by experienced personnel with a history of expertise in the evaluation of lot grading.

Having homeowners carry out the lot regrading work helped in the cost of the project. Also, though the level of performance was obviously not consistent, the end product was generally satisfactory.

An added benefit of having the homeowner do the regrading work is that he will be in a position to carry out maintenance and rebuilding as the slopes around the house settle with time.

4.2.4 Participation

In Edmonton, 32% of the owners of problem lots agreed to have a contractor carry out regrading work and to pay a portion of the cost. All 361 lots that were part of the program were regraded; 351 in 1988 and 10 in 1989. Five lot owners voiced dissatisfaction with the program. However, after clarification of a communications problem in two cases and some additional site work in the other three cases, the problems were solved.

The County program was presented as a compulsory program to the residents of Sherwood Park; but in actual fact, no enforcements were applied to those not responding to the program. As seen earlier, the calculated participation was 80.3% for Sherwood Park as a whole.

It is probable that, if the Sherwood Park program had been a voluntary program, the percentage of respondents would have been in the 25% to 30% range.

The City of Edmonton perceived that any bylaws dealing with lot grading and lot drainage would be unenforceable if challenged; so they opted for a voluntary program. The County proceeded on the basis that their bylaws were enforceable; so they opted for the compulsory program.

If the aim is to optimize the number of rectified lots, a compulsory program appears to be more efficient than a voluntary program.

4.3 Program Effectiveness

As mentioned in Articles 2.8 and 3.8, the absence of before-and-after monitoring of sanitary sewer flows has prevented measurement of the effectiveness of the regrading programs.

The City of Edmonton conducted flow monitoring in Dunluce/Warwick and Lago-Lindo in 1989. The CH2M

Hill report stated that although there were no storms of major magnitude, during a storm on June 26/27, 5.3% of the rainfall in Lago-Lindo entered the sanitary sewers and during the lesser storm of July 7/9, 8.7% of the rainfall entered the sanitary sewers. This indicates that a large proportion of stormwater is still entering the sanitary sewer system in that area.

In Edmonton and Strathcona County, increasing the capacity of the sanitary sewer system has served to reduce the danger of sanitary sewers backing-up into basements.

The results of the 1989 Dunluce/Warwick and Lago-Lindo monitoring programs indicate that, if it were not for the increase in capacity of the sanitary sewer systems, another large rainfall event would probably cause repeat basement flooding in those areas.

32% of deficient lots in Dunluce/Warwick and Lago-Lindo and 80% of deficient lots in Sherwood Park were regraded. The Mean Lot Grade Efficiencies in both areas indicate that a significant portion of lot area, even after regrading, drains toward the house and hence to the weeping tile and sanitary sewers.

The exclusion from the lot regrading programs of decks, patios, driveways and major excavation at the rear-of-lot has reduced the effectiveness of the program.

In Strathcona County, the Capital Region Sewage

Commission has been unable to detect a reduction in stormwater infiltration to the sanitary system as a result of the Sherwood Park lot regrading program.

From the foregoing, it can be deduced that the effectiveness of the programs in Strathcona County and the City of Edmonton has been less than optimum.

4.4 Financial Considerations

The cost to the County including materials, trucking and rental of equipment, bentonite clay, summer staff salaries, advertising, printing, etc., was $238,000.00.

This figure can be broken down as follows:

One-time lot inspection:	
4,263 lots @ $10.00/lot	$42,630.00
Advertising, Printing, etc.	29,970.00
Lot inspection and follow-up:	
3,355 lots @ $20.00/lot	67,100.00
Provide topsoil and/or bentonite:	
3,355 lots @ $29.30/lot	98,300.00
	$238,000.00

The average cost of approximately $70.00 per lot is fairly minimal.

This compares with the City's average net cost of $1,134.12 per lot for rectification of 287 lots, as outlined in Appendix I. Half of this amount was covered by Federal Government Funding. The City's program was for a smaller number of lots and included contractor's men and equipment, as well as material such as sod, timber for retaining walls and materials for window wells.

The County's program was on a larger scale, was better planned, was "compulsory" and required homeowners to supply labour at their own cost.

A compulsory program, properly backed up by enforceable bylaws, wherein the homeowners themselves provide labour for rectification of deficient lot grading, would appear to be the most economic method of running a lot regrading program.

4.5 Public Acceptance

From the replies to the questionnaire, it can be deduced that the general understanding of the program was good. The questionnaire also showed a good acceptance rate from those involved in the program.

However, in Sherwood Park, 560 lot owners (20%) chose not to do regrading work on their lots; and, in Edmonton, 761 lot owners (68%) chose not to have lot regrading work done on their lots.

The poorer response from Edmonton is probably because the program was voluntary and involved payment of an average of $200 by the lot owner.

If the Edmonton lot owner did not have a flooding or wet basement, and the lot seemed reasonably graded from his point of view, it may seem natural for the homeowner to decline the City's offer to alter the landscaping for $200. This is what occurred in 68% of the cases.

Where lots needed to be rectified in Sherwood Park, the County intimated to the owner that the deficiency had to be corrected within one year. The County also offered free materials. This strategy was 80% effective.

From the foregoing, it would appear that an element of compulsion encourages public acceptance. Charging the lot owner a portion of the cost of the work may work against acceptance.

4.6 Legal Considerations

A description of bylaws was presented earlier in this report in Articles 2.3 and 3.3.

The City of Edmonton has felt constrained by the Municipal Government Act. Municipal Bylaws are subsidiary to the Province of Alberta, Municipal Government Act. Article 248 of the Municipal Government Act addresses "Minimum standards for buildings":

> "A council may by bylaw establish and enforce minimum standards for existing property in the municipality."

Article 248 describes notification of properties that do not comply with the bylaw but does not deal specifically with right of entry on the property to initially assess non-compliance.

For instance,

> "(4) The Bylaw is not enforceable with respect to property until notice has been sent by registered mail . . .

> (a) stating that the property does not comply with the standards prescribed . . . ."

This infers that a municipality has the right to state that a property does not comply with the bylaw, but it does not have the right to enter onto the property to make inspections to establish the non-compliance.

From the point of view of the City of Edmonton this is a chicken-and-egg situation that should be resolved at an early date.

At the 1990 Association of Urban Municipalities of Alberta (AUMA) Convention the City of Edmonton submitted the following resolution:

"Resolution: City of Edmonton
Amendment of S.248 of Municipal Government Act to expressly provide for a Right-of-Entry

WHEREAS Section 248 of the Municipal Government Act, R.S.A. 1980, Chapter M-26 permits municipalities, by bylaw, to prescribe standards for the maintenance and occupancy of property within the municipality, and further provides for the administration and enforcement of such bylaws;

WHEREAS Section 248 does not contain express provisions respecting entry onto property for its inspection and for the purposes of the administration and enforcement of minimum standards bylaws by municipal officers, agents and employees;

WHEREAS it is desirable that Section 248 contain an express right-of-entry authority so as to facilitate the application of municipal bylaws and further the purposes of minimum standards legislation:

NOW THEREFORE BE IT RESOLVED that the Alberta Urban Municipalities Association request that the

Government of Alberta amend Section 248 of the Municipal Government Act so as to contain an express authority of the municipality to enter onto property for the purposes of administering or enforcing minimum property standards bylaws."

The resolution was carried and, in October of 1990, was forwarded to the Minister of Municipal Affairs for Government response.

The Government has responded by informing the AUMA that it is preparing a "new" Municipal Government Act. Section 324 of Division 3, "Enforcement of municipal law" from the latest discussion draft of the proposed new Act reads,

"324 Municipal inspections

(1) If this or another enactment or a bylaw authorizes or requires anything to be inspected, remedied, enforced or done by a municipality, a person authorized by council may, after giving reasonable notice to the owner or occupier of the land, building, structure or thing,

(a) enter or inspect, at any reasonable time, anything authorized or required to be inspected, remedied, enforced or done by this or another enactment or a bylaw,

(b) request anything to be produced to assist the entry or inspection, and

(c) take copies of anything related to the entry or inspection.

(2) The person authorized must display or produce on request identification showing that the person is authorized to make the entry or do the inspection.

(3) In an emergency or in extraordinary

> circumstances the person authorized need not give reasonable notice, or enter or inspect at a reasonable hour."

From the point of view of the Strathcona County it is considered that existing Provincial Statutes and Municipal Bylaws are sufficient to enable the County to enforce its Lot Drainage Policy.

4.7 Lot Grading Surveys

In Strathcona County and Edmonton a total of 63 lots were surveyed. The following points are noted:

.1 The 32 lots inspected in Edmonton are divided into eight categories, single family or zero lot line; either originally approved, condemned-rectified, condemned-not- rectified or not originally inspected. It would not be reasonable to attach much weight to findings for each category due to the small number of samplings; an average of four per category.

.2 The Strathcona County survey assigned three categories to the lots surveyed; either originally approved, condemned-rectified or condemned-not-rectified. The closeness of Lot Grade Efficiency for each category indicates that it would not be valid to make comparisons.

.3 Overall it is not possible to make a "before" and "after" comparison of lot regrading because, where there is a Lot Grading Efficiency assigned to a "Condemned Lot-rectified", there was not a measure of the efficiency of that same lot in its original state.

> The results of the Lot Inspections show that, at present, in Lago-Lindo, Edmonton, and in Glen Allan, Strathcona County, the average Lot Grade Efficiency is 75.6%. This means that almost 25% of the area of the lot is draining towards the house and that, potentially, 25% of the rainfall on the lot eventually enters the sanitary sewer through the weeping tile system.

If roof drain downspouts, splash pads, etc. were properly installed so that 100% of the roof area drained away from the building, the mean Lot Grade Efficiency would increase to 82.2%, a 6.6% improvement from the existing situation. It appears that this is a lot improvement that could be pursued on a vigorous basis. The cost of rectification is minimal; and, enforcement could be regular and on-going.

The inspections of the 63 lots revealed the following allotment of mean lot grade deficiencies:

.1 Sides -- 3.4%
.2 Fronts -- 1.9%
.3 Backs -- 12.5%
.4 Roofs -- 6.6%

The majority of the lots inspected drain from back of lot to front of lot. Grading is fairly easy at the front since the ground level at the house is normally about 0.40 m above the back of sidewalk and the 0.40 m slope is effected across the lot width.

Drainage from the back of lot has to be conducted around the house and this calls for a slope away from the back of the house for a distance of 1.50 metres or more. Inspections showed that, on average, 12.5% of the area of the lot drained towards the back of the house. Regrading work in many backyard situations was not attempted because of the existence of block, brick or concrete patios, concreted garage areas or raised wooden decks. Even when these features were not present, grading work was not carried out because of the amount of earthworks required. In only one of the 63 inspections was a perfect situation found- namely, a 5%-10% slope from the house to a swale 2.0 metres from the back of the house draining to the sides.

The basic grading layout of the RPL (zero lot line) lots caused drainage problems. Side drainage to a lot line invariably impinged on the next house. Because of this, the inspection did not discover any improvement in side drainage at RPL's. In some cases, it appeared that regrading on RPL lots exacerbated the situation by improving the grading at one house and increasing drainage to the neighbour.

For RF1 (single family lots), the sides of lots were relatively easy to regrade and, from most information received from the County and the City, it appears that most lot regrading improvements took place in this area.

However, any improvement of 50% in the efficiency of side lot grading would contribute only 1.7% to the average lot grade efficiency of 75.6%. Whereas the more effective downspout correction, on the other hand, as demonstrated earlier, would yield a 6.6% improvement, with minimal effort and cost.

4.8 Commentary from Experienced Agencies

4.8.1 Input from Edmonton Home Builders Association

On October 17, 1991 a meeting was held with a knowledgeable representative of the Edmonton Home Builders Association. The following comments were provided:

.1 Since October 1989, the City of Edmonton has increased control over lot grading. Not only are weeping tile drains no longer connected to sanitary sewers for new houses, but the City of Edmonton Occupancy Permit requires that proper lot grading be certified before the permit is issued.

.2 Currently, moneylenders are beginning to request evidence of lot grading performance prior to approving, or even renewing mortgages.

.3 Responsibility for policing lot grading is still a controversial issue and discussions on this matter are ongoing between the City of Edmonton, house-builders and private developers.

.4 Public awareness of lot grading responsibilities has definitely increased.

.5 The motto "keep your basement dry" would be more effective than "keep your neighbour's basement dry".

.6 Lot grading was better managed in the Seventies where a house-builder would have a block of 10 to 20 homes in a row. The more recent trend of individual builders developing individual lots has contributed to non-compatible lot grading between neighbours.

.7 Lot grading on zero-lot-line lots could be controlled by imposing a drainage easement on each lot which would allow for a swale to intercept flows across the lot.

.8 Regarding Lot Grade Efficiencies, badly graded side-yards could negate the effect of well-graded backyards.

.9 Most builders normally grade the clay properly on the lots. Grading problems are often the result of improper installation of topsoil or landscaping; and then may be exacerbated by the addition of decks and patios.

4.8.2 City of Edmonton, Building Inspection Branch

On October 22, 1991 a meeting was held with knowledgeable representatives of the Building Inspection Branch, Planning and Development, City of Edmonton.

The following points came out of this meeting:

.1 Since August 1989, the City of Edmonton has been empowered by Bylaw 9198 to enforce proper grading on residential lots. The key factor in this bylaw is the "lot grading plan adopted by Council". The Alberta Building Code 1985 under Article 1.5.1.13 states that "the authority having jurisdiction may require an owner to have a building site graded in conformance with a surface grading plan, established by the council of the local authority".

.2 Since August 1989, new developments have been required to have the lot grading plan adopted by Council. However the City of Edmonton is not in the position of being able to apply Bylaw 9198 retroactively to developments prior to August 1989. Because Lago-Lindo and Dunluce/Warwick were developed before 1989, the City has felt itself unable to apply the terms of Bylaw 9198 to those subdivisions, since they never had a grading plan "adopted by Council".

.3 Lot grading and regrading is an ongoing requirement.

.4 In many cases, owners flood themselves because of poor grading on the lot.

5.0 CONCLUSION

Storm water infiltration into sanitary sewer systems in Edmonton and Strathcona County, on several occasions during the past ten years, has caused back-up of sanitary sewers into basements and overloading of sewage treatment plants.

Lot regrading programs were implemented by these municipalities, on the premise that, in areas where weeping tile systems are connected to sanitary sewers, proper lot grading will reduce the infiltration of storm water into the sanitary sewers.

A necessary first step in a lot regrading program is lot inspection. Strathcona County based its authority for inspection on Bylaw 15-78 "The Sewers Bylaw", and for enforcement on Bylaw 10-87, "The Property Drainage Bylaw".

Although a strict interpretation of the Municipal Government Act casts doubt on the right-of-entry for inspection purposes, these bylaws were never challenged during the course of the County lot regrading programs. However, any doubts regarding the legality of these bylaws will soon be academic, as the Provincial Government's "new" Municipal Government Act will enable municipalities to have the right to:

> "enter or inspect, at any reasonable time, anything authorized or required to be inspected, remedied, enforced or done by this or another enactment or a bylaw".

The City of Edmonton felt constrained by the Municipal Government Act and this, in large part, led them to institute a voluntary program for lot regrading. On the other hand, Strathcona County considered that it had the necessary enforceable bylaws and consequently embarked on a compulsory program.

The study of Strathcona County and City of Edmonton lot regrading programs has shown that these programs were well implemented. The County program, which required the homeowners to provide the labour, appeared to be the more cost effective.

The combination of lot regrading and other inflow and infiltration reduction measures has resulted in a drastic decrease in the incidence of basement flooding in both Edmonton and Strathcona County.

Of great value in the lot regrading programs was the public education aspect, which will hopefully serve to perpetuate public awareness regarding the importance of establishing and maintaining proper grades on lots.

While the lot surveys carried out by this report were not conclusive, it can be deduced, with non-participation in the programs being taken into account, that the City of Edmonton and Strathcona County programs reduced extraneous flow to the weeping tile systems by between 5% and 10%.

The regrading programs have made a significant contribution to the reduction of extraneous flows to sanitary sewer systems in these municipalities.

However, this contribution could be greatly improved with more participation from homeowners and an increased awareness of the effect of poorly graded patios, decks and paved roads on weeping tile flow. Immediate improvement could be attained, at very little cost, with rectification of deficiencies in roof leader discharge.

6.0 RECOMMENDED GUIDELINES FOR LOT REGRADING

Monitoring flows in a sewer over a period of time will enable a municipality to determine whether the sewer has capacity for its ultimate service area. It will also measure the amount of storm infiltration into the system and indicate prophylactic measures to prevent future problems.

There is a cost to monitoring; approximately $7,500 per station per annum. But that cost is only a fraction of that involved in rectifying damages to flooded basements or enlarging sewer lines on an emergency basis. For instance, the emergency sewer enlargement programs undertaken by the City and the County respectively cost $17 million (page 53) and $10 million (page 5).

The following point-by-point procedure is recommended as a program for any municipality which desires to safeguard itself from future problems caused by overloading sanitary sewers.

1. A record of flows in sanitary sewers should be established. Such a record would determine dry weather flows and wet weather flows over three to four years. Monitoring should be for large areas to determine the impact on the system as a whole. However, three areas of 50 lots each should be monitored as "sub-cells".
2. An analysis of three (3) or four (4) years' monitoring followed by a study which takes into account future contributory areas to the sanitary sewer system, should reveal whether a problem exists or a potential problem will exist in the future.

3. If it is determined that a problem or potential problem exists, a program to rectify that problem should be initiated.
4. If the solution includes lot regrading, a pilot lot regrading program should be initiated.
5. It is recommended that, initially, a pilot lot regrading program be carried out on three sub-cells. Appendix O describes a possible pilot lot regrading program on three sub-cell areas.
6. Analysis of the sub-cell lot regrading programs should show to what extent the programs are a success; at this stage, it should be an arithmetic exercise to determine what further lot regrading work is necessary to achieve the required goals of the overall program.
7. In the event that a full-scale lot regrading program is to be undertaken, it is recommended that public education for instituting lot regrading programs consist of one-on-one interviews and pamphlets entitled "Protect Your Neighbour's Basement", written up as previously recommended in this report.
8. By-laws should be in place empowering municipal officials to enter onto private property to ensure that the storm drainage scheme and lot grading are in accordance with municipal standards. See Appendix O for a Guideline for a Lot Drainage Control Bylaw.
9. Rectification of lot regrading should be made compulsory. It should be done by the householder. Materials, such as earth fill and sod, should be supplied by the municipality.

10. If lot regrading is not done by householders within the required time frame, the municipality should do the work and add the cost to the householder's taxes.
11. The organization required by a municipality for the administration of a monitoring and regrading program will depend on municipal resources available, on the urgency of the situation, on funds available and on the type and magnitude of the program envisaged.

BIBLIOGRAPHY

1. Sewer Rehabilitation Investigations, Dunluce/Warwick & Lago-Lindo Subdivisions, CH2M Hill for the City of Edmonton, 1988.

2. 1989 Flow Monitoring Program, Dunluce/Warwick and Lago-Lindo, CH2M Hill for the City of Edmonton, 1989.

3. Study of Sewerage Facilities for the South End Water Pollution Control Centre, W.L. Wardrop & Associates Ltd. for the City of Winnipeg, 1979.

APPENDIX A

COUNTY LOT INSPECTION FORM

Conforms ☐
Recommendation ☐
Bentonite req'd. ☐

STRATHCONA COUNTY

SH. PK. LOT GRADING IMPROVEMENT PROGRAM – INSPECTION FORM

DATE: ____________ TIME: ______________________ ☐ SUNNY
HOUSE ADDRESS: ______________________________ ☐ OVERCAST
INSPECTION BY: ______________________________ ☐ RAIN

Sketch of Lot

LEGEND
☐ Patio
☐ Driveway
☐ Sidewalk
☐ Flower bed
☐ Lawn
☐ Gravel

△
FRONT OF LOT

LOT GRADING EVALUATION:

Lot conforms with the parameters of the program. ☐ YES ☐ NO

comments: ____
____

Material required: topsoil __________ m^3 bentonite clay __________

ROOF DRAINAGE SYSTEM:

Eavestroughs in good repair? ☐ YES ☐ NO (if no, indicate location on sketch)
Downspout extensions are in place and of length (1.8m)? ☐ YES ☐ NO

comments: ____
____

Homeowner(s) have a maximum of one year to correct deficiencies.

Please contact the Engineering Branch once remedial work is complete.

For material delivery or further information call Public Works – Engineering Branch at 464-8030 or 464-8040.

white – residents copy yellow and pink – office copy

APPENDIX B

COUNTY ADVERTISEMENTS AND PAMPHLETS

LOT GRADING IMPROVEMENT PROGRAM

Program Introduction

The Sherwood Park Lot Grading Improvement Program will commence in May, [illegible] and will result in a cooperative effort between homeowners and Strathcona County to reduce the volume of rainwater entering the sanitary sewer system during periods of heavy rainfall.

Strathcona County completed a [illegible] million sanitary sewer relief system in [illegible] to reduce the risk of basement flooding in Sherwood Park. The relief system has performed admirably by carrying excess rainwater away during storms; however, the County is committed to minimize the volume of rainwater entering the sanitary sewer system.

This commitment will create a substantial increase in capacity within the relief system to allow future developments in Sherwood Park to connect to it. The expansion of the sewer relief system's service area will be beneficial to ratepayers in having additional residents sharing the surcharge payments associated with the construction cost of the system. Also, the reduction in rainwater in the system will fulfill the County's obligation to the Capital Region Sewage Commission in minimizing peak flows during rainfall which, in the past, have affected the performance of the treatment facility.

The Lot Grading Improvement Program is being conducted to ensure houses in Sherwood Park have roof and lot drainage systems in accordance with Bylaw No. [illegible] and Bylaw No. [illegible].

The following is an outline of the stages involved with the implementation of the program.

Stage I

In early May, County staff will begin to inspect all residential properties within Sherwood Park which were established prior to January 1, [illegible]. The inspections will be done on a block by block progression having Sherwood Park divided into five areas.

A gauge will be used to determine the slope at which the lot is graded within the 1.0 m (3 feet) area around the perimeter of the house.

Next, the lengths of downspout extensions will be checked.

All deficiencies will be listed on a form and a copy of the completed form will be left in the homeowner's mailbox. This report is intended to be used as a guide in carrying out any work required.

Stage II

During this on-going inspection period, a stockpile of material will be available (weather permitting) from which residents may draw fill to improve their lot grading prior to or after inspection of their property. The stockpile location will be advertised in the News at a later date.

Stage III

Homeowners requiring fill material to correct deficiencies outlined on their inspection reports may contact the County's Public Works Engineering Branch at [illegible] or [illegible] and order material delivered to their homes. Delivery will be made to the resident within one week of the request date (weather permitting) so remedial work may be undertaken as soon as possible.

Stage IV

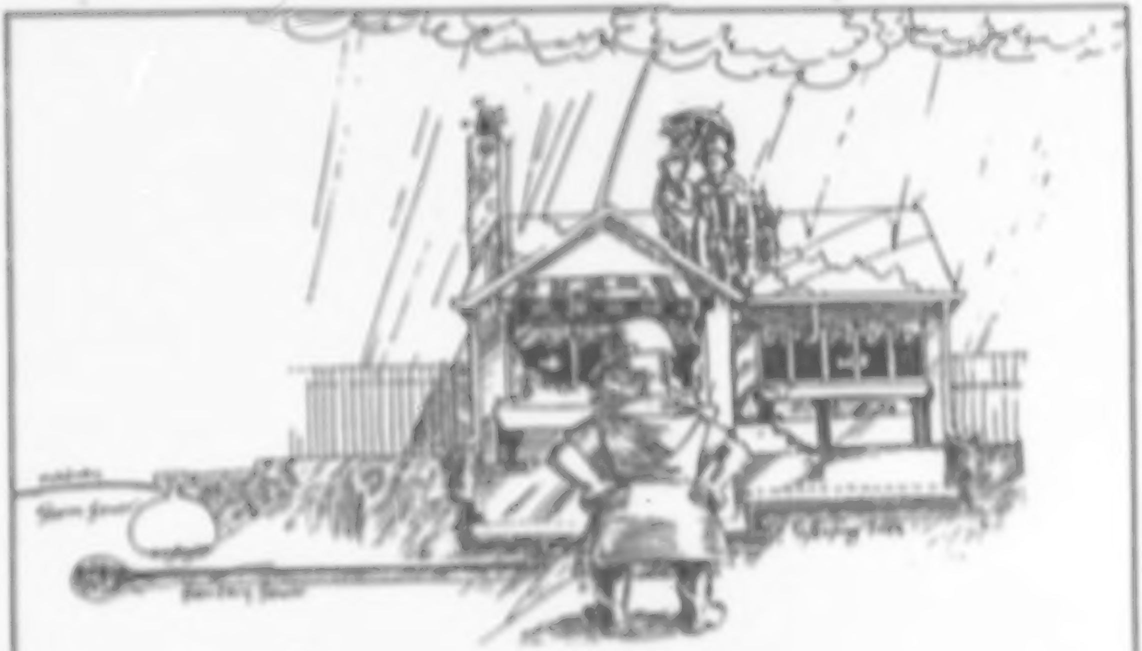
For the remainder of the program any homeowner desiring an inspection of remedial work completed under the program is encouraged to call the Engineering Branch at [illegible] or [illegible] to arrange for a final inspection.

Note: Residents will have one year from inspection date to have all remedial work completed.

Strathcona County are looking forward to the cooperation of Sherwood Park residents in making this program a success.

In next week's issue of The News watch for an ad explaining the relationship between the roof and lot drainage conditions and their effect on the weeping tile system of your home.

For further information please contact the Engineering Branch at 464-8276.



Strathcona County

Downspout Extensions - Roof Drainage

With the rainy season upon us it is again time to ensure proper downspout extensions are in place on all roof drains.

Residents of Sherwood Park, including those having sump pumps in their basements are required to discharge their roof drains a minimum 1.5 meters (5 feet) from their basement walls (See figure 1).

Careful consideration should be given to the direction your downspout is pointed and the ultimate drainage path to the storm sewer on the street. Avoid creating a surface water problem for a neighbor.

With all residents cooperating in this effort the sanitary sewer system will serve the community more efficiently and the risk of basement flooding during rainstorms will be further reduced.

Should you require further information or have a specific problem or concern regarding downspout extensions contact Public Works at [illegible].

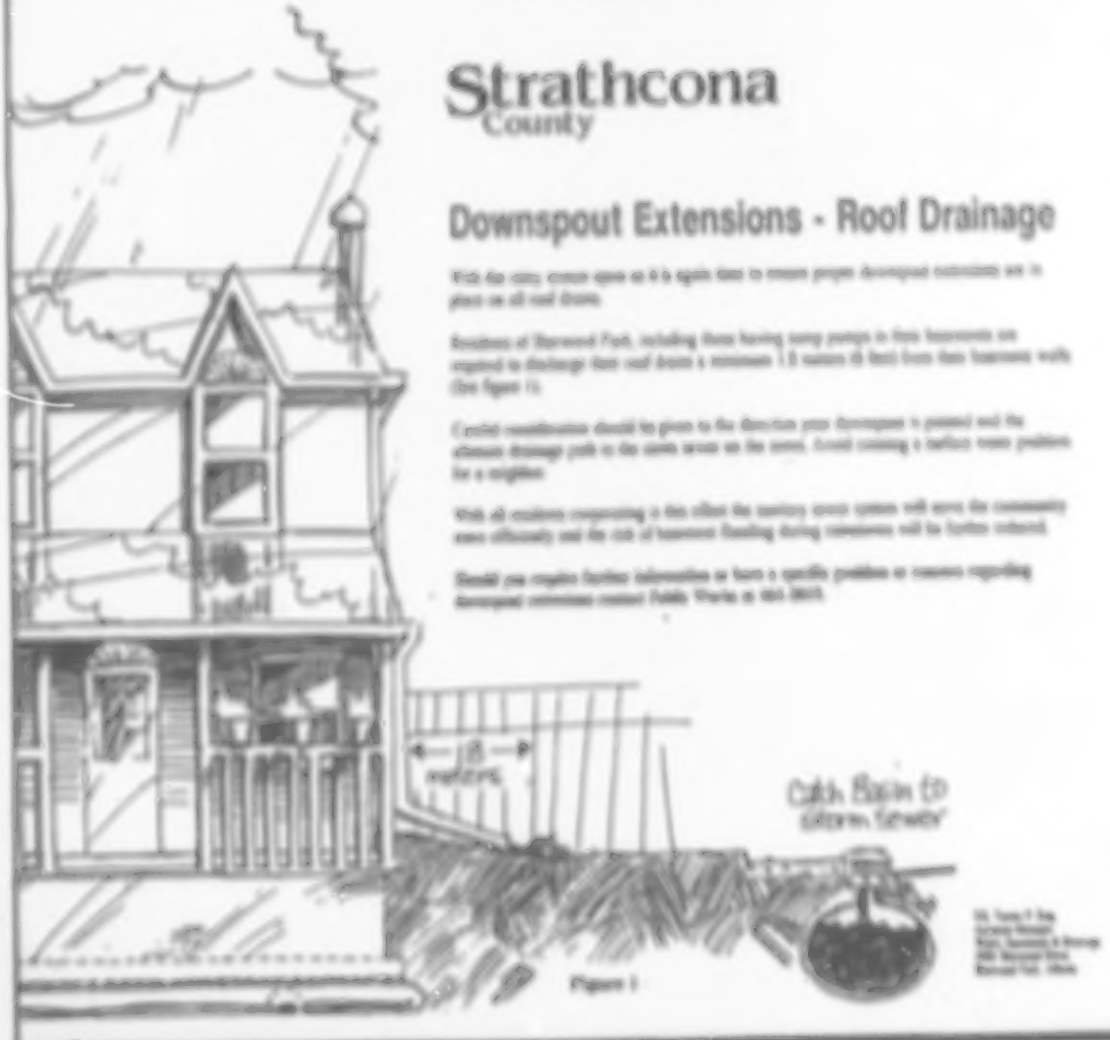
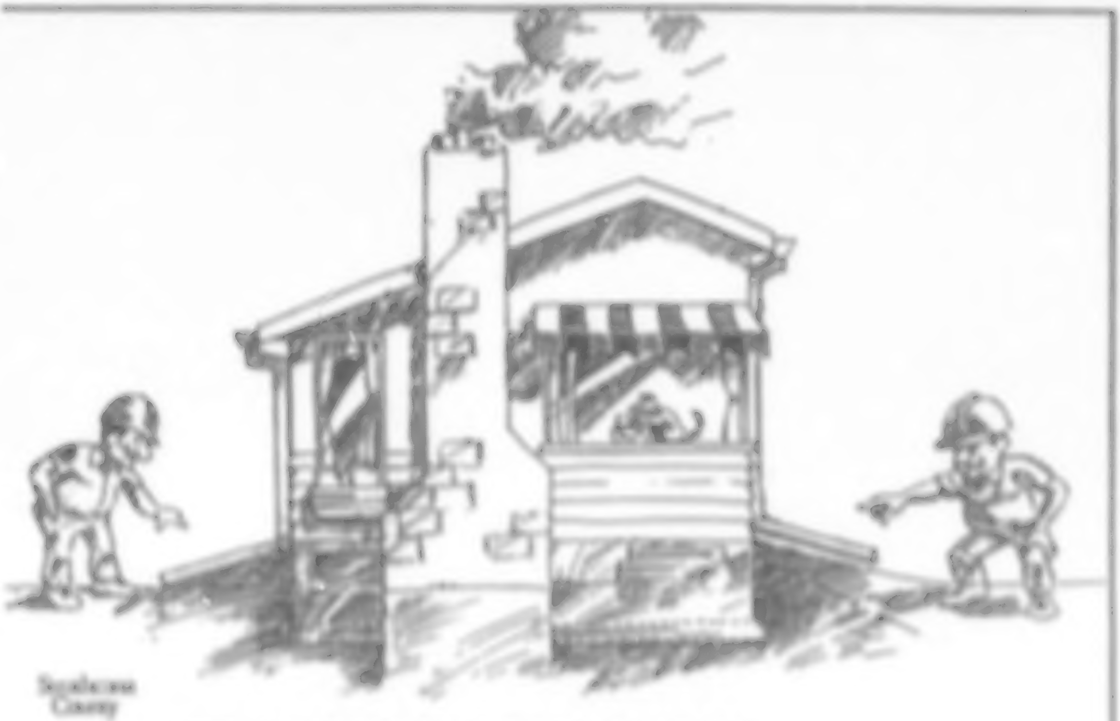

1.5 meters
Catch Basin to Storm Sewer

Figure 1

[illegible]



Strathcona County

STRATHCONA COUNTY 1987 LOT GRADING IMPROVEMENT PROGRAM

ROOF AND LOT DRAINAGE SYSTEMS

The sanitary sewer system in Sherwood Park is designed to carry domestic sewage as well as the weeping tile drainage from building foundations. Surface water from rain and snowmelt is to be disposed of through a separate system of storm sewers.

In light of the commitment the County has made to reduce the amount of surface water entering the sanitary sewer system, it is important to understand the critical relationship between the roof and lot drainage systems and their effect on the weeping tiles around your home.

For example, a 2.5 cm (one inch) rainfall on a roof of a 115m² (1,236 ft.²) bungalow will create 3,300 litres (750 gallons) of runoff onto the ground. Without adequate downspout extensions in place and proper lot grading to allow the water to run away from the house the majority of this water will soak down to the building foundation and enter the sewer system through the weeping tiles. You can imagine the pressure that would be put on the County's sanitary sewer system by the 8,000 plus residences in Sherwood Park if such runoff water is allowed to enter the sewer system.

We cannot eliminate all of this runoff water from entering the weeping tiles but it is important to minimize such inflow.

The capacity of the sanitary sewer system could be drastically increased during periods of heavy rainfall if all homes in Sherwood Park incorporated the standards shown above. The Lot Grading Improvement Program has been initiated to accomplish this goal and with all residents cooperating in this effort the sewer system will serve the community more efficiently and the risk of basement flooding will be further reduced.

In the next issue of The Scene another ad will illustrate a method by which residents can evaluate the lot grading conditions and requirements around the perimeter of their homes.

For further information contact the Engineering Branch at 464-8270.

STRATHCONA COUNTY 1987
LOT GRADING IMPROVEMENT PROGRAM

Strathcona County

LOT GRADING EVALUATION BY THE HOMEOWNER

Bylaw No. 10-87 states that a positive slope between 6% and 10% must exist within the first 1.8 m (6 feet) from the wall of the house. This means a drop between 75 mm (3 inches) and 150 mm (6 inches) for the first 1.8 m (6 feet) away from the house. This first 1.8 m (6 feet) area around the home is significant as it is highly susceptible to settlement and water penetration because it was excavated at the time the basement was constructed.

Bylaw No. 13-78 states that downspout extensions must discharge roof runoff a minimum 1.8 m (6 feet) from the basement wall.
REMEMBER: The lower the volume of water being absorbed by this area during a rainfall, the lower the volume of water entering the weeping tile.

The homeowners can check the slope around their homes and establish the areas in which fill will be required by use of a simple tool.

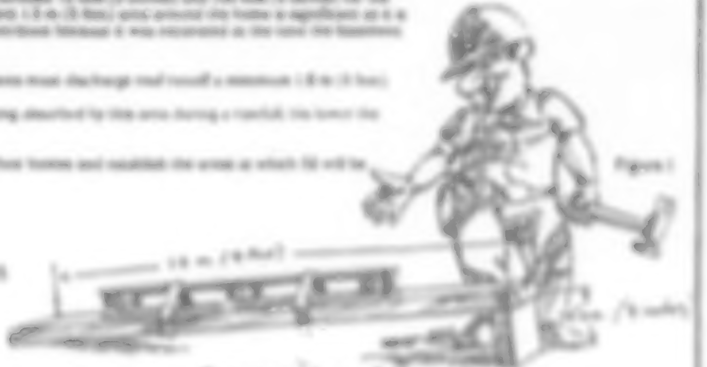


Figure 1

Materials for Construction of Slope Gauge

- 1 1.8 m (6 foot) board
- 1 75 mm (3 inch) wood block
- 1 carpenter's level
- tape and nails

Construction of Slope Gauge

1. Nail block to underside of board as shown in Figure 1.
2. Tape level to topside of board as shown in Figure 1.

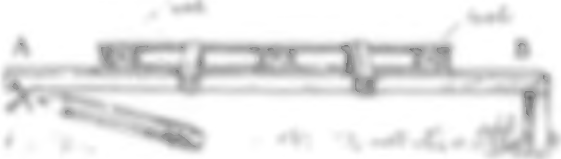


Figure 2

Use of Slope Gauge

1. Place end A of slope gauge against the exterior wall of the house and allow end B to rest on the ground as in Figure 2.
2. Level the board with the carpenter's level.
3. Once level, draw a line on the wall at location 'x', Figure 2, using the underside of the board as a straight edge. This is a fill reference point.
4. If, during Step 2 the board cannot be levelled you have more than an adequate slope at that location.

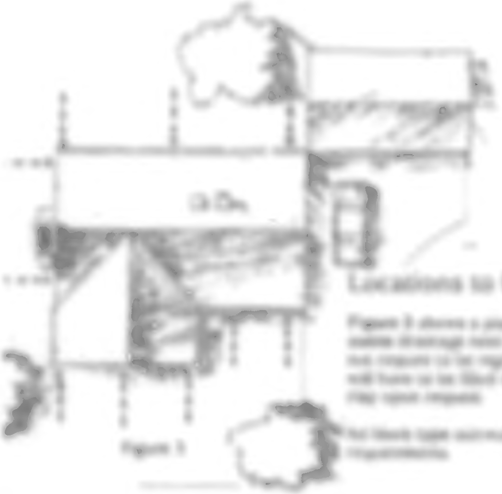


Figure 3

Locations to Use Slope Gauge

Figure 3 shows a plan view of a typical lot and where the slope gauge should be used to assess drainage next to the house. Note that poured concrete driveways, patios and sidewalks do not require to be regraded. However, any gaps which exist between these and a foundation wall will have to be filled with a sealant, see Figure 4. The County will provide a supply of bentonite clay upon request.

All block type sidewalks and patios should be regraded to allow for the sufficient slope requirements.

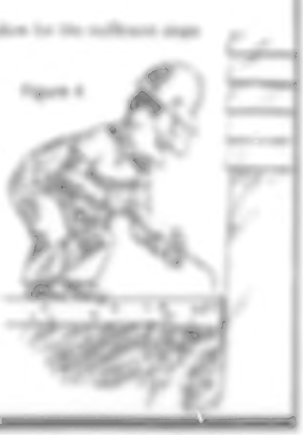


Figure 4

Once each side of the building has been assessed and you discover that fill is required in some locations, a string line should be set on the respective fill reference points and material added to that level.

Basement windows which would otherwise be covered by fill material should be accommodated with a window well or berm. Note the County will not be providing window wells.

At the time of inspection County crews will establish fill reference points on the walls of all homes which require fill material.

In next week's issue of The News an ad will discuss the transition of a poorly drained lot to an acceptable, well drained condition.

For further information contact the Engineering Branch at 464-8276.

HOW TO PARTICIPATE IN THE PROGRAM

The Lot Grading Program is a four step process in which you, the homeowner, can do your part in further reducing the risk of flooding and keeping [illegible] [illegible] [illegible].

Step 1:

Understand the inspection report for your lot
At the time of inspection in 1987 inspection reports were left to resident's [illegible]. Call Public Works for clarification or assistance. If you require a copy of your lot report contact Public Works and a duplicate will be provided.

Step 2:

Order materials for yard work
Call Public Works and order your fill material and/or limestone chip. Your delivery will be scheduled at the time of your request, and there is no charge for this service.

Step 3:

Yard Work
Place fill material around your home according to the inspection report and if applicable place limestone chip according to directions provided.

Step 4:

Final Inspection
Contact Public Works and schedule your final inspection.

IF YOU HAVE ANY GRADING WORK OR INSPECTIONS OUTSTANDING, CALL PUBLIC WORKS.

PUBLIC WORKS, 464-8019

Strathcona County looks forward to working with you to complete all lot grading improvements required under this program.

Strathcona County

Lot Grading
Improvement Program

Hamlet of
Sherwood Park
Alberta

Strathcona
County
PUBLIC WORKS

May, 1990

LOT GRADING IMPROVEMENT PROGRAM

The Sherwood Park Lot Grading Improvement Program will continue through 1990. The County is encouraging homeowners who have not yet completed the required work on their lots to do so this year.

County Public Works will continue to provide the fill material and bentonite clay delivery service to assist residents in completing remedial work. The County will begin delivering materials in early May, weather permitting.

WHY IMPROVE LOT GRADING?

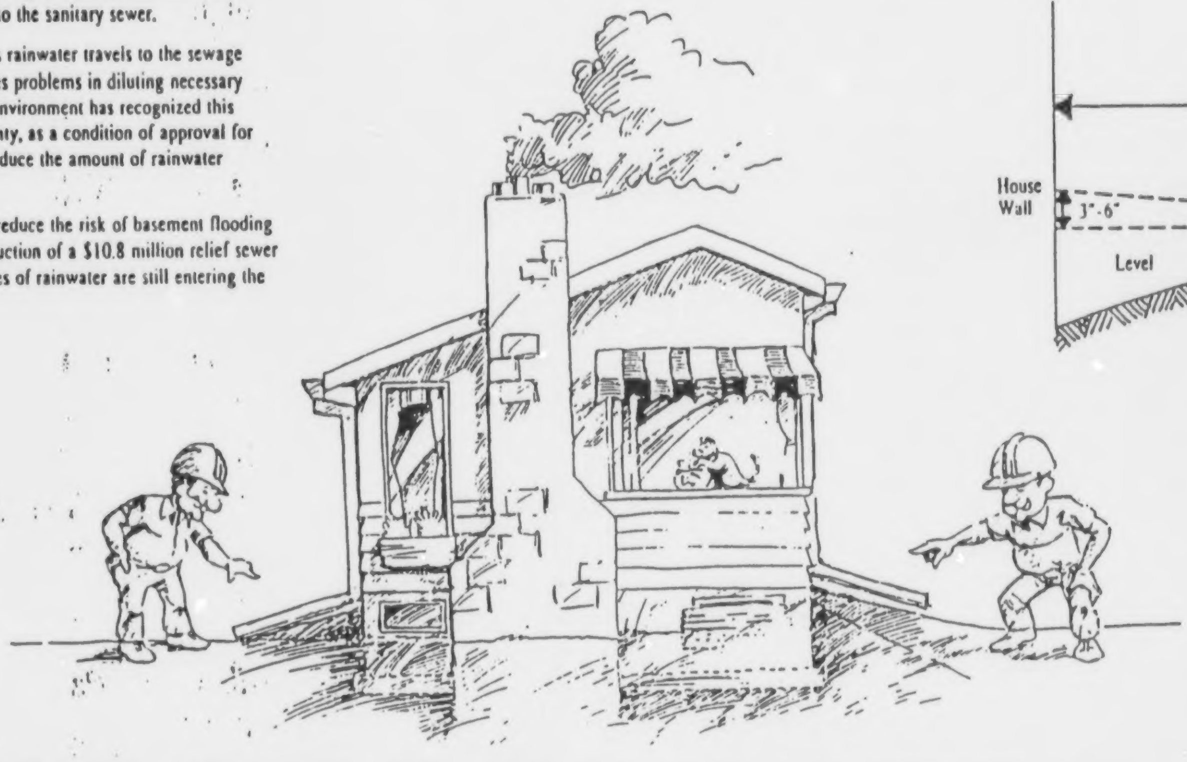
In the past rainwater has caused flooding problems in Sherwood Park as it has been allowed to run against basement walls where it either entered the basement directly or flowed down the wall to the weeping tile system and into the sanitary sewer.

Once in the sanitary sewer this rainwater travels to the sewage treatment plant where it creates problems in diluting necessary treatment processes. Alberta Environment has recognized this problem and requires the County, as a condition of approval for the relief sewer program, to reduce the amount of rainwater entering the treatment plant.

The County has been able to reduce the risk of basement flooding in Sherwood Park with construction of a $10.8 million relief sewer system. However large volumes of rainwater are still entering the treatment plant.

WHAT AREA OF MY LOT IS AFFECTED BY THE PROGRAM?

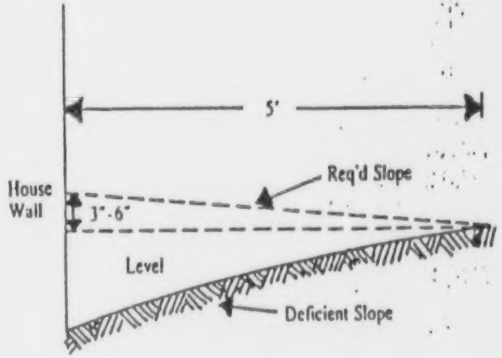
The Sherwood Park lot grading bylaw requires that all homeowners have a positive slope running away from the sides of their homes. This will ensure that only a minimal amount of rainwater will appear in the sanitary sewer.



The primary area of concern is the first five feet from the basement wall as this soil was backfilled after your basement was constructed. (See Figure 1). Over the years this soil begins to sink, allows water to run against the basement wall where it passes easily to the weeping tile. This is the area of your lot which the County inspected in 1987 and this is the only area where remedial work may be required. The County does not expect residents to regrade poured concrete patios, sidewalks or driveways however, bentonite clay will be provided to seal any gaps that exist next to the basement wall. Block-type patios and sidewalks are to be regraded if they do not slope away from the house.

Basement windows within an area requiring fill should be bermed or have a window well set in place. The County does not provide window wells.

Figure 1



APPENDIX C

COUNTY BY-LAW NO. 15-78

BYLAW NO. 15-78

A Bylaw regulating the use of public and private sewers and drains and the disposal of sewage and the discharge of waters and waste into the County of Strathcona No. 20 sewer system.
This Bylaw may be cited as The Sewers Bylaw

WHEREAS the County of Strathcona No. 20 has constructed and now maintains a sewerage system consisting of storm and sanitary sewers; and

WHEREAS the City of Edmonton by agreement provides sewage treatment for the County of Strathcona No. 20; and

WHEREAS it is deemed just and proper to levy a sewerage system charge on all persons occupying property connected with the sewerage system of the County/City to assist with the costs of constructing and maintaining the system including the cost of treatment and disposal of sewage.

NOW THEREFORE the Municipal Council of the C[illegible] Strathcona No. 20 assembled, enacts as follows:

PART I

DEFINITIONS

Unless the context specifically indicates otherwise the meaning of terms used in this Bylaw shall be as follows:

101 B.O.D. (Denoting "Biochemical Oxygen Demand") - shall mean the quantity of oxygen utilized in the biochemical oxidation of organic matter under standard laboratory procedure in five days at 20° centigrade, expressed in milligrams per liter.

102 BUILDING DRAIN - shall mean that part of the lowest horizontal piping of a drainage system in a building and to within 3 feet of the outer wall of the building that receives the discharge from a soil-pipe or waste pipe or other drainage pipe and conveys it to the building sewer.

103 BUILDING SEWER - shall mean that part of a drainage system outside building commencing at a point three feet from the outer face of the wall of the building and connecting the building drain to the public sewer or place of disposal of sewage.

104 CITY - shall mean the City of Edmonton.

105 COMBINED SEWER - shall mean a sewer receiving both surface run-off and sewage.

106 COUNTY - shall mean the County of Strathcona No. 20.

107 ENGINEER - shall mean the County Engineer or the County Administrator or such person as may from time to time be designated by the County Administrator.

108 GARBAGE - shall mean solid wastes from the preparation, cooking and dispensing of food, and from the handling, storage and sale of produce.

109 INDUSTRIAL WASTES - shall mean liquid wastes from Industrial processes.

110 NATURAL OUTLET - shall mean any outlet into a water course, pond, ditch or lake, or other body of surface or ground water.

111 OWNER - shall mean the registered owner of a property or the purchaser thereof who is entitled to occupy and enjoy the property.

112 PERSON - shall mean any individual, firm, company, association, society, corporation or group.

113 pH - shall mean the logarithm of the reciprocal of the hydogen ion concentration in moles per liter and denotes alkalinity or acidity.

114 PROPERLY SHREDDED GARBAGE - shall mean the waste from the preparation, cooking and dispensing of food that has been shredded to such a degree that all particles will be carried freely under the flow conditions normally prevailing in public sewers, with no particles greater than one-half inch in any dimension.

115 SANITARY SEWER - shall mean a sewer which carries sewage and to which storm, surface and ground waters are not intentionally admitted.

116 SEWAGE - shall mean a combination of water carried wastes from residences, business buildings, institutions and industrial establishments; together with such ground, surface and storm waters as may be present.

117 SEWAGE TREATMENT PLANT - shall mean any arrangement of devices and structures used for treating sewage.

118 SEWAGE WORKS - shall mean all facilities for collecting, pumping, treating and disposing of sewage.

119 SEWER - shall mean a pipe or conduit for carrying sewage.

120 STORM SEWER OR DRAIN - shall mean a sewer which carries storm and surface waters and drainage, but excludes sewage and polluted industrial wastes.

121 SUSPENDED SOLIDS - shall mean solids that either float on the surface of, or are in suspension in water, sewage or other liquids and which are removable by laboratory filtering, and are measured in milligrams per liter.

122 WATER COURSE - shall mean a channel in which a flow of water occurs, either continuously, or intermittently.

123 PLUMBING AND DRAINAGE - Provincial Plumbing Regulations - Department of Manpower and Labour - Plumbing and Drainage Regulations.

124 FOUNDATION DRAIN - shall mean that system of underground piping normally placed continuously around the outside of a building at the lowest building foundation elevation which intercepts ground water in the soil and conveys such water to the building sewer.

125 ROOF RUN-OFF COLLECTION SYSTEM - shall mean that system of drainage of building roofs which directs stormwater or snow - meltwater to a downspout.

126 DOWNSPOUT - shall mean a pipe which conveys water from the roof run-off collection system of a building to near the ground surface.

127 DOWNSPOUT EXTENSION - shall mean a pipe or impermeable trough which conveys water from the lowest end of a downspout to the ground surface.

128 LOT GRADE - shall mean the slope of the final ground surface on private property.

PART II

USE OF PUBLIC SEWERS REQUIRED

201 No person shall place or deposit, or permit to be deposited in any manner that is unsanitary upon public or private property within the County of Strathcona No. 20 or in any area under the jurisdiction of the County, any human or animal excrement, garbage or other objectionable waste.

202 No person shall discharge to any natural outlet within the County or any area under the jurisdiction of the County, any sanitary sewage, industrial waste or other polluted waters except where suitable pre-treatment has been approved in accordance with subsequent provisions of this bylaw.

203 The owner of every house, building or property used for human occupancy, employment recreation or other purpose, situated within the County and abutting on any street, lane or right-of-way in which there is now or hereafter located, a public sanitary sewer of the County shall at his own expense, install suitable toilet facilities therein and shall connect such facilities with the proper sewer in accordance with the provisions of the Provincial Plumbing Regulations.

204 No person shall, except as permitted by this bylaw or the Provincial Plumbing Regulations or the regulations of the Provincial Board of Health, construct or maintain any privy, septic tank, cesspool or other facility intended or used for the disposal of sewage.

PART III

PRIVATE SEWAGE DISPOSAL

301 Where a public sanitary sewer or combined sewer is not available, the owner of a building as described in Section 203, shall connect the building sewer to a private sewage disposal system which system shall comply with the provisions of this bylaw, The Provincial Plumbing Regulations and the regulations of the Provincial Board of Health.

302 At such time as a public sewer becomes available to a property served by a private sewage disposal system the provisions of Section 203 shall then apply to the property and a direct connection shall be made to the public sewer and any septic tanks, cesspools or similar private sewage disposal facilities shall be abandoned and filled with suitable material.

303 The owner shall, at no expense to the County, operate and maintain the private sewage disposal facilities in a sanitary condition at all times.

304 Nothing contained in this Bylaw shall be construed to interfere with any additional requirements that may be imposed by the County Health Officer.

PART IV

BUILDING SEWERS AND CONNECTIONS

401 No person shall uncover, make any connections with or opening into, use alter or disturb any public sewer or appurtenances thereof, unless he has been authorized in writing to do so by the Engineer.

402 All building sewers shall be constructed by the County's forces from the public sewer to the property line.

403 No person shall connect his own sewer lines to any sanitary, combined, or storm sewer without first having made written application to the County on forms supplied by the Engineer and being granted a permit to make such connection.

404 No building sewer or private property shall be constructed unless it conforms to the requirements of this Bylaw and the Provincial Plumbing Regulations. Such building sewer shall be constructed by the Owner's forces and at his expense.

405 Permits for building sewers on private property shall be obtained from the County and applications for such permits shall be made on approved forms furnished by the Engineer. Such permit applications shall be supplemented by any plans, specifications or other information considered pertinent by the Engineer.

406 The County shall, at County expense, maintain the building sewer from the main to the property line.

407 The Owner shall, at his own expense, maintain the building sewer from his property line to the building.

408 In the event that any sewer connection is abandoned, the Owner, at his expense shall effectively block up the connection at a suitable location within his property in order to prevent sewage backing up into the soil and to guard against soil or dirt being washed into the sewer.

409 No person shall connect a building downspout to a sanitary sewer or to a building foundation drain which is connected to a sanitary sewer.

PART V

USE OF PUBLIC SEWERS

501 No person shall discharge or cause to be discharged any storm water, surface water, roof run-off, sub-surface drainage other than that from foundation drains, cooling water or unpolluted industrial water to any building sewer connected to a sanitary sewer or to a sanitary sewer, provided that the Engineer may on application authorize such discharge where exceptional conditions prevent compliance with the foregoing provisions.

All buildings which have a building sewer connected to the sanitary sewer shall also have a roof run-off collection system consisting of eave troughs or parapets or such other devices as will convey water to a downspout or downspouts.

Such buildings shall also have a downspout or downspouts for each separate portion of the roof run-off collection system. Each downspout shall have a downspout extension securely fastened or placed and of such length as to direct the water conveyed to the street or lane without draining back towards the building but in no instance shall the downspout extension be terminated less than six feet horizontally from the outside of the building wall.

The lot grade around a building which has a building sewer connected to the sanitary sewer shall be such that no surface water can flow towards the building within five feet horizontally from the ouside of the building wall.

502 Storm water and all other unpolluted drainage shall be discharged to such sewers as are specifically designated as storm sewers, or to a natural outlet approved by the County.

503 Except as hereinafter provided, no person shall discharge or cause or permit to be discharged any of the following described waters or wastes to any public sewer:

(a) Any liquid or vapor having a temperature higher than 170° F.

(b) Any water or waste containing fat, oil or grease of such character or quantity that unusual attention or expense is required to handle such materials by the County collection system or the City sewage treatment plant, but the weight of oils and grease shall in no case exceed the limit set out in Section 506 (c) of this Bylaw.

(c) Any gasoline, benzine naptha, fuel oil or other flammable or explosive liquid solvent or gas.

(d) Any garbage that has not been properly shredded.

(e) Any ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastics, wood or other solid or viscous substance capable of causing obstruction to the flow of sewers or other interference with the proper operation of the sewage works.

(f) 1. Any paunch manure or intestinal contents from horses, cattle, sheep or swine;
   2. Pigs hooves or toenails;
   3. Animal intestines or stomach casings;
   4. Bones;
   5. Hog bristles;
   6. Hides or parts thereof;
   7. Animal fat or flesh in particles larger than will pass through a one-quarter (1/4") inch screen.
   8. Horse, cattle, sheep or swine manure;
   9. Poultry entrails, heads, feet, feathers or eggshells;
   10. Fleshings and hair resulting from tanning operations.

(g) Any waters or wastes having pH lower than 5.5 or above 12.0 or having any other corrosive property capable of causing damage or hazard to structures, equipment, biological sewage treatment processes, and personnel of the sewage works.

(h) Any waters or wastes containing a toxic or poisonous substance in sufficient quantity to injure or interfere with any sewage treatment process, constitutes a hazard to humans or animals, or create any hazard in the receiving waters of the sewage treatment plant.

(i) Any waters or waste containing suspended solids of such character and quantity that unusual attention or expense is required to handle such materials at the sewage treatment plant, but no such suspended solids shall contain more than four hundred milligrams per liter as set out in Section 506 (b) of this Bylaw.

(j) Any noxious or malodorous gas or substance capable of creating a public nuisance.

504 Grease, oil and sand interceptors shall be provided on private property for all garages, gasoline service stations and vehicle and equipment washing establishments; interceptors will be required for other types for businesses when in the opinion of the Manager, they are necessary for the proper handling of liquid waste containing grease in excessive amounts, or any flammable wastes, sand and other harmful ingredients, except that such interceptors shall not be required for private living quarters or dwelling units. All interceptors shall be of a type and capacity approved by the Engineer and shall be so located as to be readily and easily accessible for cleaning and inspection. Where installed, all grease, oil and sand interceptors shall be maintained by the Owner at his expense in continuously efficient operation at all times.

505 In case any blockage, either wholly or in part of said sewage system is caused by reason of failure, omission or neglect to comply strictly with the foregoing provisions, the Owner, proprietor or occupier concerned therein shall, in addition to any penalty for infraction of the provisions hereof, be liable to the County for all costs of clearing such blockage and for any other amount for which the City may be liable because of such blockage.

506 If a person discharges industrial waste or sewage to a sewer within the County exceeding any of the following characteristics and limits:

(a) A five day B.O.D. greater than seven hundred milligrams per liter, or

(b) Containing more than four hundred milligrams per liter of suspended solids, or

(c) Containing more than two hundred milligrams per liter of oils and grease,

then such person shall pay a charge computed as set out in Section 701 (c) of this bylaw.

507 No Municipality or person shall discharge or cause to be discharged into any sewer within, or entering the County sewers, waste water, domestic sewage, commercial sewage, industrial or factory waste without obtaining a license so to do from the County in the manner provided, but no such license shall be given by the County until:

(a) Such municipality or person has made application in writing for permission to discharge industrial or factory waste or sewage into a sewer within, or entering the County system; and

(b) Such applicant shall have given the chemical and physical analysis, quantity and rate of discharge or sewage proposed to be so discharged, and any other detailed information that is required, including all pertinent information relating to any proposed pre-treatment before discharge; and

(c) The application has been formally approved in writing.

508 Where necessary, in the opinion of the County, the person making application for a license shall provide, at his expense, such preliminary treatment as may be necessary to change the characteristics of the industrial waste or sewage to make it acceptable to the County before any license may be granted it being understood that the County shall not apply more stringent treatment requirements than thos established by this bylaw. Where preliminary treatment facilities are provided for any industrial waste or sewage, they shall be maintained continuously in satisfactory and effective operation by the applicant at his own expense.

509 When required by the County, any industry, served by a sewer connection carrying industrial waste, shall install a suitable control manhole in the sewer connection to facilitate observation, sampling and measurement of the waste. Such manhole, when required, shall be accessibly and safely located and shall be constructed in accordance with plans approved by the Engineer. The manhole shall be installed by the owner at his own expense and shall be maintained by him at all times.

510 All measurements, tests and analyses of the characteristics of industrial waste, sewage or water to which reference is made in this bylaw shall be determined in accordance with the "Standard Method for the Examination of Water and Sewage" of the American Pulbic Health Associaton, and shall be determined at the control manhole provided for in Section 509 of this bylaw, or from suitable samples taken within the plant.

511 No statement contained in this bylaw shall be construed as preventing any special agreement or arrangement between the County/City and any industrial concern whereby an industrial waste of unusual strength or character may be accepted by the City for treatment subject to payment thereof by the industrial concern.

PART VI

POWER AND AUTHORITY OF INSPECTORS

601 The County and other duly authorized employees of the County bearing proper credentials and identification, shall be permitted to enter upon all properties for the purpose of inspection, observation, measurement, sampling and testing in accordance with the provisions of this bylaw. If such inspection discloses any failure, omission or neglect to clean out such sumps, or discloses any defect in the location, construction, design or maintenance of any of the sewer system or any connection therefrom to the County system, or discloses any defect in the roof run-off collection system, downspouts or downspout extensions of any building or the lot grade around any building which has a building sewer connected to the sanitary sewer, the person making such inspection shall in writing notify the said owner, proprietor or occupier to rectify, at his expense, the cause of the complaint. In the event of continued noncompliance, the license to operate or use said premises shall be cancelled until such time as proper maintenance or alterations have been made, or penalties as outlined elsewhere in this Bylaw may be invoked.

PART VII

SEWER SERVICE CHARGE

701 The County does hereby levy a sewerage service charge on all persons or municipalities occupying property connected with the sewerage system of the County to be paid monthly computed as follows:

(a) In the case of property connected to the sewerage system and served by the City water, when the industrial waste or sewage is within the limits set out in Section 506, then a charge of 15 cents per one thousand imperial gallons of water shall be billed with the water bill montly. A minimum montly charge of 60 cents shall be made on all accounts.

(b) In the case of property connected to the County sewerage system served in whole or in part with water from sources other than the City, when the industrial waste or sewage is within the limits set out in Section 506, the charge shall be that stipulated in Section 701 (a). Where no meter or other exact means exist to determine the quantity of water with which any property is served, the Engineer shall make an estimate of such quantity for the purpose of determining the sewer service charges and such estimate shall be final and conclusive. The occupant of any property may, however, at his own expense, install and maintain an approved type meter upon which the service charge shall thereupon be determined.

C.d. m.

(c) A person whether using City water or not, whose sewage discharge exceeds any or all of the limits set out in Section 506 shall on utility bills rendered on or after the 1st day of January, A.D. 1974, be charged on such overstrength sewage as sampled regularly from the plant effluent in a manner to be determined as follows: "N" is a multiplying factor of the fifteen (15) cents base rate and is determined by the following formula:

$$N = \frac{\text{B.O.D. Tested - B.O.D. Allowed (700 mg/l)}}{2100} + \frac{\text{Solids Tested - Solids Allowed (400 mg/l)}}{2100} + \frac{\text{Grease Tested - Grease Allowed (200 mg/l)}}{600}$$

702 To determine the rate and amount to be charged each month, the County will

(a) In the case of existing industries already connected where testing has been done in the past to determine the strength of their sewage discharged, charge such industry an average rate (N factor in the formula) based on the strength of sewage as determined by tests over sufficient period to establish a reasonable average rate.

(b) (i) In the case of new industries connecting to the system or existing industries that change their method of treatment so as to vary the strength of sewage discharged, establish a new basis of charge based on an average of at least four separate twenty-four or sixteen hour tests carried out by the County over a period of at least one month and using an average of four separate tests.

(ii) The above provision will apply when an industry has established new treatment equipment or for any reason is of the opinion that the nature of its sewage being discharged has a substantially lessened degree of pollution than as shown by prior tests, it may request the County to make new tests, such tests to be at the expense of the industry.

(iii) If the County is satisfied that such tests were made when the plant was operating under normal conditions, the results of the latest tests shall be used in computing the monthly charge as set forth in Section 701 hereof.

(iv) The County shall periodically at its discretion, run tests at each plant to determine the strength of the sewage discharged as a check. If these tests show that the strength of the sewage is consistently stronger than the average previously determined, then a new average will be determined based on four 24-hour or 16-hour tests in one or more months.

PART VIII

PENALTIES

801(1) If the owner or occupier of any building, which building under the provisions of this bylaw is required to be connected with the water main or common sewer, or both, shall neglect or refuse to make such required connection in accordance with the provisions of this Bylaw for a period of sixty (60) days after notice in writing, which has been given to him personally or to some adult person at the building required to be connected, by the Health Officer or his authorized agent, or to prosecute the work without delay, or to the satisfaction of the County then and in that case the County shall, at the expense of the person who is in default, make or repair the said connections and the County may recover the expenses thereof with costs, by any Court of competent jurisdiction or in like manner as municipal taxes.

c.d.m.

801(2) If the owner or occupier of any building which has a building sewer connected to the sanitary sewer, which building under the provisions of this Bylaw is required to have a roof run-off collection system, downspout(s), and downspout extensions and a lot grade around the perimter of the building sufficient to direct surface water away from such building, shall neglect or refuse to install, maintain, or correct any defect in such devices in accordance with the provisions of this Bylaw for a period of sixty (60) days after notice in writing, which has been given to him personally or to some adult person at such building, by the Engineer or his authorized agent, or to prosecute the work without delay, or to the satisfaction of the County then and in that case the County shall, at the expense of the person who is in default, make or repair the said devices and the County may recover the expenses thereof with costs, by any Court of competent jurisdiction or in like manner as municipal taxes.

801(3) The person giving such notice shall post a copy of the notice on the front door or some other conspicuous part of the building referred to in the notice. No person shall tear down or deface any notice so posted.

802 No person shall continue in violation of any provisions of this Bylaw for more than thirty (30) days after receiving written notice from the County of such violation. Such notice shall be sufficiently served if forwarded by registered mail to the owner at the address of the property where the violation is occurring.

803 Where any person is convicted of an offence under this Bylaw, then the provisions of City of Edmonton Bylaw No. 2101 providing for the imposition of penalties for infractions of City Bylaws shall govern.

PART IX

GENERAL

901 In case of any dispute as to the proper to which any property is subject by reason of the provisions herein contained, the matter shall be referred to the Engineer and where the dispute is not then settled to the satisfaction of a property owner such owner may refer the matter to County Council. Final appeal may then be made in the manner provided for in the Arbitration Act of the Province of Alberta.

902 Bylaw No. 238 is hereby rescinded.

First reading MARCH 16, 1978

Second reading MARCH 16, 1978

Third reading MARCH 16, 1978

Reeve

Secretary-Treasurer

APPENDIX D

COUNTY MUNICIPAL POLICY HANDBOOK

COUNTY OF STRATHCONA NO. 20

PAGE 1 OF 4

Municipal Policy Handbook

Policy Title: LOT DRAINAGE POLICY AND CORRECTION PROGRAM	Policy No. 60-62-015
Policy Category: ☐ Operational ☒ Regulatory ☐ Interjurisdictional	Cross Reference: Lot Drainage Bylaw Sewer Bylaw
Policy Area: ☐ Legislative ☐ Executive Administration ☐ Corporate Services ☐ Government Services ☒ Municipal Operations	Date of Approval by Council: July 8, 1986
	Resolution No. 561/86
Lead Role: Engineering Services	Effective Date: July 8, 1986
Support Role: Building Inspections	
Review Dates:	Replaces:

POLICY STATEMENT

OBJECTIVE

The objective of the policy is to reduce the infiltration through weeping tiles into the sanitary sewer system in Sherwood Park by improving the surface drainage at and around the affected buildings in Sherwood Park.

This policy is applicable to residents and buildings owners within the Strathcona County urban service area.

SPECIAL NOTATIONS

Issue Date	Revision #	Revision Date		Issued By	Approved By
July 8/86				S. Lee	R. Powell

Policy Title: LOT DRAINAGE POLICY AND CORRECTION PROGRAM	Policy No. 60-62-015

POLICY STATEMENT /Continued . . .

1. Inspection and Design

1.1 Each residential lot will be surveyed by the Engineering Services Department and plotted on a standard 8 1/2 x 11 sheet.

1.2 In assessment of lots the following grading and standards will be used:

a) Acceptable

Drainage away from the building is a minimum of 3% slope for a minimum of 1.5 m in all locations. Ground appears to be totally settled and there are no drainage impediments that would cause water to pond sufficiently that it would reach the basement wall. Downspouts, leaders and splash pads positively drain.

b) Advisory Correction

The slope is between 1% and 3% away from the building at any location or there is a drainage restriction that creates a significant possibility of ponding up to the basement wall.

c) Mandatory Correction

Slope from the foundation is less than a positive 1% slope or there is a serious restriction to drainage which will obviously cause water to pond against a basement wall or to flow into a basement through a window or downspouts or leaders cause water to be discharged less than 1.5 m from the basement wall.

Policy Title: LOT DRAINAGE POLICY AND CORRECTION PROGRAM	Policy No. 60-62-015

POLICY STATEMENT /Continued . . .

1.3 Where the concrete or asphalt driveways or other permanent structures are in conflict with remedial activities, the case will be reviewed by the County Engineer and a special design may be provided and implemented.

1.4 The Engineering Department will provide residents with the survey results and advise necessary remedies if applicable.

2. Construction

2.1 Suitable material will be provided by the County of Strathcona through the Engineering Services Department.

2.2 Funding of supply and delivery of the necessary material will be provided by the County through the Sewer Operating Program.

2.3 Each resident will be responsible to place, or cause to be placed, the material in accordance to the design provided by the Engineering Services Department.

Residents requiring assistance will contact the program supervisor to arrange the selection, supervision and payment of a landscape contractor and the necessary tax recovery arrangements.

2.4 The cost and scheduling of the program will be controlled by the Engineering Services Department.

Policy Title: LOT DRAINAGE POLICY AND CORRECTION PROGRAM	Policy No. 60-62-015

POLICY STATEMENT /Continued . . .

3. Notification to Residents

3.1 Residents must be notified of the intent of the program.

3.2 Notice must be given the residents before entering the properties to perform the above mentioned duties.

3.3 The residents must be advised of and receive copies of the survey results and the implications of same.

3.4 The residents must be notified of any bylaws and regulations related to the subject matter.

4. Security

4.1 Staff doing survey and liaison will be required to wear distinctive identification.

21.29.86

APPENDIX E

COUNTY PROPERTY DRAINAGE BY-LAW

BY-LAW 10-87

A BY-LAW OF THE COUNTY OF STRATHCONA NO. 20 TO ESTABLISH AND ENFORCE MINIMUM STANDARDS FOR THE MAINTENANCE OF PROPER DRAINAGE OF EXISTING PROPERTY WITHIN THE HAMLET OF SHERWOOD PARK IN THE COUNTY OF STRATHCONA NO. 20 IN THE PROVINCE OF ALBERTA.

WHEREAS the Municipal Government Act, being Chapter M-26 of the Revised Statutes of Alberta, 1980, provides that a Council may by By-Law establish and enforce minimum standards for existing property in the municipality;

AND WHEREAS the Council of the County of Strathcona No. 20 deems it just and proper to establish minimum standards with respect to the drainage of existing properties within the Hamlet of Sherwood Park;

AND WHEREAS the Council of the County of Strathcona No. 20 desires to reduce infiltration of ground water into the sanitary sewer through weeping tile connected to existing buildings located on property within the Hamlet of Sherwood Park;

NOW THEREFORE the Council of the County of Strathcona No. 20 in the Province of Alberta, duly assembled, enacts as follows:

SECTION I - NAME OF BY-LAW

1.1 This By-Law may be cited as "the Property Drainage By-Law".

SECTION 2 - DEFINITIONS

2.1 In this By-Law, unless the context otherwise requires,

(a) "Building" means anything constructed or placed on, in, over or under land but does not include a highway or a public roadway or a bridge forming part of a highway or a public roadway;

(b) "Council" means the Council of the County of Strathcona No. 20;

(c) "County" means the County of Strathcona No. 20 in the Province of Alberta;

(d) "County Engineer" means the Chief Engineer of the County of Strathcona No. 20 or his designate;

(e) "Development Appeal Board" means the Development Appeal Board of the County of Strathcona No. 20;

(f) "Minimum Drainage Standards" means the standards for the maintenance and improvement of the drainage away from existing buildings on property located within the Hamlet of Sherwood Park as established by the County Engineer;

(g) "Owner" means the person shown as the owner of land on the assessment roll of the County Council prepared under the Municipal Taxation Act, Revised Statutes of Alberta, 1980, Chapter M-31;

(h) "Person" means any individual and includes corporations, firms, partnerships, associations and other unincorporated entities;

(i) "Property" means any land located within the Hamlet of Sherwood Park with a building situate thereon.

SECTION 3 - MINIMUM DRAINAGE STANDARDS

3.1 The owner, lessee or occupant of any Property shall establish and maintain drainage patterns on the Property in accordance with Minimum Drainage Standards and ensure that the drainage is away from any building located on the property.

SECTION 4 - ENFORCEMENT

4.1 Where Property has not been maintained in compliance with the minimum drainage standards established pursuant to this By-Law, the County Engineer may send a written notice by registered mail to or serve upon the owner of the Property, and all other persons shown by the records of the North Alberta Land Titles Registration Office to have an interest in the Property, and on the occupant, if any;

(a) stating that the Property does not comply with the minimum drainage standards prescribed in this By-Law and that repairs are required to be made to it, giving reasonable particulars of the repairs required to be made;

(b) stating the time within which the repairs are to be made which shall be a minimum of two (2) months; and

(c) stating that if the repair is not so done within the terms specified, the County through its agents, employees or contractors may carry out the repairs and the cost of the work done may be levied against the Property as a debt due to the municipality or charged against the land concerned as taxes due and owing in respect of that land and to recover the costs as such.

4.2 A person entitled to notice under Subsection 4.1 may, within fourteen (14) days of receipt of the notice, appeal in writing to the Development Appeal Board of the County.

4.3 The Development Appeal Board shall hold a hearing of each appeal and in determining the appeal it may:

(a) confirm, reverse or vary the decision appealed from; and

(b) grant an extension of not more than one (1) year from the end of the time specified in the notice given under Subsection 4.1 within which the repairs are to be made;

but no extension shall be granted unless the Development Appeal Board is of the opinion that a refusal of the appeal would result in undue hardship and not more than two (2) extensions may be granted in respect to any property.

SECTION 5 - REPEAL OF BY-LAW 45-86

5.1 By-Law 45-86 is hereby repealed.

SECTION 6 - EFFECTIVE DATE OF BY-LAW

6.1 This By-Law shall take effect on the 3rd day of March, A.D., 1987.

Read a first time this 3rd day of March, A.D., 1987.

Read a second time this 3rd day of March, A.D., 1987.

Read a third and final time duly passed, this 3rd day of March, A.D., 1987.

COUNTY OF STRATHCONA NO. 20

PER: ______________________
REEVE

PER: ______________________
CORPORATE SECRETARY

17.28.86

SCHEDULE "E"

LOT GRADING AND SITE DRAINAGE CONSTRUCTION STANDARDS

GENERAL

The standards specified herein will apply to construction within the building sites and are to supplement the Alberta Building Code and the Strathcona County Land Use By-Law.

LOT GRADING

The finished elevations at all corners of the lot and the ground next to the building shall be as established by the County and as specified in the Development Permit.

Any changes must be approved, in writing, by the County.

SITE DRAINAGE

Positive drainage must be established away from the building to the gutter or drainage channels as designed.

An initial minimum gradient of 10% shall be established and maintained for the ground within 1.5 meters adjacent to the building and 2% for the balance of the unpaved portion, of the lot. Overburden and slope on excavated areas may be governed by the standard of backfilling which is achieved.

Drainage patterns demonstrated in the attached drawing may be used as guidelines.

DRAINAGE OF BUILDING FOUNDATIONS

Weeping tiles and other foundation drains shall meet Alberta Building Code requirements. Disposal of weeping tile and other foundation drainage shall be subject to County approval. Disposal into the sanitary sewerage system is prohibited. In most cases, this will require the provision of a sump pump discharging to the surface drainage system or discharge into a storm sewer system designed to accommodate the anticipated weeping tile flow.

BACKFILL OF TRENCH AND BUILDING EXCAVATIONS

Native material may be used for backfill of trench and building excavations within the site.

In accordance with good construction practice, all trench and foundation backfill must be adequately consolidated at the time of construction by water flushing and/or mechanical compaction to ensure that when subsequent natural settlement is complete, that final grades will be acceptable. The County will inspect backfill prior to issuance of an Occupancy Permit or the permit may be issued after provision of an appropriate performance bond if weather conditions preclude adequate consolidation and inspection prior to occupancy.

SITE IMPROVEMENTS

Site improvements shall not alter or disrupt the drainage pattern as established by the County.

Landscaping and structures such as solid fences, retaining walls and permanent or temporary buildings which may disrupt surface drainage shall not be permitted.

APPENDIX F

COUNTY LETTER AND QUESTIONNAIRE

MUNICIPAL ADDRESS: 1 OCTOBER 23, 1990

Dear Householder:

RE: ASSESSMENT OF LOT REGRADING PROGRAMS

The Alberta Government, Department of Municipal Affairs, is funding a study to assess the value of measures taken by various municipalities to improve lot grading.

Walker Consulting Group Ltd. has been chosen to carry out this study.

A major part of the project is the collection of information regarding the lot regrading program that was recently carried out in your neighbourhood.

The local government of Strathcona County has given us permission to approach you and ask you to respond to a questionnaire.

The questionnaire is being distributed to one hundred sixty (160) households in your area.

It will be greatly appreciated if you would take about 10 minutes to answer the questions on the attached form and return the completed questionnaire to us in the stamped addressed envelope.

The contents of your questionnaire will be dealt with in strict confidence and used only for compiling data and statistics.

Your elected officials support the need to have a comprehensive assessment and the information gathered will undoubtedly benefit future lot grading programs.

We thank you very much for participating in the project.

Yours truly,

WALKER CONSULTING GROUP LTD.

D. ARMSTRONG, P.ENG., Project Co-ordinator
DA/abp
Encl.
C:\WP50\ENG\DA\QUESTION\COUNTY\LTR.PF

QUESTIONNAIRE

MUNICIPAL ADDRESS 1_______________________________________

ASSESSMENT OF LOT REGRADING PROGRAMS

1. NAME OF HOUSEHOLDER _______________________________

2. PHONE NUMBER ____________________________________

3. DID THE COUNTY OF STRATHCONA INFORM YOU THAT YOUR LOT REQUIRED TO BE REGRADED? YES ___ NO ___

   ____

4. HOW DID THE COUNTY INFORM YOU?

   LETTER ______________ PHONE __________
   WORD OF MOUTH _______ PAMPHLET ________

   ____

5. WHAT IS YOUR UNDERSTANDING OF THE REASONS FOR LOT REGRADING?

   ____

   ____

   ____

   ____

   ____

6. DID YOU HAVE A PROBLEM PRIOR TO THE REGRADING PROGRAM?

   ____

   ____

   ____

7. IF SO, WHAT WAS IT? ____________________

____

A. SEEPAGE? ____________________

B. SEWER BACK-UP? ____________________

C. OTHER? ____________________

8. WAS YOUR LOT REGRADED? ____________________

9. IF IT WAS NOT, WHY NOT? ____________________

____

____

____

10. IF IT WAS, WHO GRADED IT? ____________________

____

____

11. DESCRIBE THE WORK DONE ____________________

____

____

____

____

____

____

12. WERE YOU SATISFIED WITH THE LEAD-UP ARRANGEMENTS FOR GRADING?

____

____

13. DID THE REGRADING WORK CAUSE YOU ANY PROBLEMS? IF YES, WHAT PROBLEMS? ______

14. WHAT DID THE REGRADING WORK COST YOU? ______

15. IN YOUR OPINION WAS THE REGRADING NECESSARY? ______

16. IN YOUR OPINION DID THE REGRADING DO ANY GOOD? ______

17. DID COUNTY AND CONTRACTORS KEEP YOU REASONABLY INFORMED DURING THE REGRADING WORK? ______

18. WOULD YOU BE WILLING TO GIVE FURTHER INFORMATION IF REQUESTED?

19. WOULD YOU GIVE PERMISSION FOR YOUR LOT TO BE SURVEYED TO GATHER MORE INFORMATION? ______

20. ANY OTHER COMMENTS? ____________________

`C:\WP50\ENG\DA\QUESTION\COUNTY.LTR`

APPENDIX G

CITY LETTER TO HOUSEHOLDERS 1988

The City of Edmonton
WATER AND SANITATION

3RD FLOOR, WEST CHAMBERS
12220 STONY PLAIN ROAD
EDMONTON, ALBERTA
T5N 3Y4

May 13, 1988

Dear Resident:

SUBJECT: DUNLUCE/WARWICK AND LAGO-LINDO LOT REGRADING PROGRAM

In a continued effort to alleviate further flooding and sewer backup problems in many homes in your area, a lot regrading program has been approved by City Council. The work will be done by the Mennonite Central Committee Alberta. Funding will be shared by the City of Edmonton and the Federal Government with only 20 per cent of the construction costs met by the homeowner.

The following steps will be taken to organize and carry out this work:

1. Lots within the two subdivisions will be surveyed by CH2M Hill Engineering.

2. A representative from CH2M Hill will then contact owners of those lots with grading deficiencies. At that time a written proposal detailing the scope of the work and a cost estimate will be provided.

3. Depending on the extent of the work required, the average cost to the homeowner will be $200.

4. Upon receiving written acceptance from the homeowner, work will begin as soon as possible. Exact timing will depend on the number of lots involved.

Your participation is an essential part of the program. As well, a poorly graded lot can be harmful to your house, with seepage and basement flooding as a likely consequence. This program is an opportunity for you to protect your home against this possibility at very little cost.

Should you have any questions or if you feel that your lot may have grading deficiencies, please phone Katharine O'Connell of CH2M Hill at 488-2760. As well, we have set up information centres in two trailers, one beside the Community League Centre in Lago-Lindo (off 95 Street), the other at the junction of Dunluce Road and Warwick Road. These are manned by the consultant's staff as follows:

Lago-Lindo	Mondays and Wednesdays	4:30 - 8:30
Dunluce/Warwick	Tuesdays and Thursdays	4:30 - 8:30

Please feel free to call at these centres to have your questions answered and discuss aspects of the program.

I thank you for your cooperation to date and I urge your participation in the program. Your assistance is the best assurance we have of the success of our efforts to reduce flooding risks in your neighbourhood.

Yours truly,
EDMONTON WATER AND SANITATION

John Vos

JOHN VOS, P. Eng.
ACTING MANAGER OF DRAINAGE

APPENDIX H

CITY LOT REGRADING AGREEMENT

LOT REGRADING AGREEMENT

BETWEEN:

THE CITY OF EDMONTON
(herinafter called the "City")

– and –

[redacted]

(hereinafter called the "Owner")

WHEREAS rainstorms have caused flooding and sewer backups in the Dunluce/Warwick and Lago Lindo Communities in the City of Edmonton;

AND WHEREAS in an effort to alleviate further flooding and sewer backup problems the City has recommended lot regrading work be done in these Communities;

THEREFORE, in consideration of the City's coordination and subsidizing of the lot regrading program, the Owner hereby agrees as follows:

1. The Owner is the registered owner of the property described as:

Municipal Address: [redacted]

Legal Description: Lot [redacted] Block [redacted] Plan [redacted]

2. The Owner acknowledges that the lot regrading is being performed by an independent Contractor, not the City, and the Owner requests, authorizes and permits CH2M Hill Engineering Ltd. and the Mennonite Central Committee Alberta to enter the above described property with personnel, machinery and equipment to perform the lot regrading work outlined in Schedules 1 and 2 attached to this Agreement.

3. The Owner agrees to pay the City of Edmonton the sum of 260^{00} within 30 days from the date of mailing of the invoice for this regrading work. Accounts that remain unpaid 30 days after the date of the invoice shall bear interest at the rate of 1 1/2% per month pursuant to City of Edmonton Bylaw 5150.

4. The Owner acknowledges that the lot regrading work is intended to alleviate the incidence and severity of flooding and that there is no representation or guarantee that the lot regrading work will eliminate all flooding and sewer backups in the Dunluce/Warwick and Lago Lindo Communities.

SIGNED THIS [redacted] DAY OF [redacted] 1988.

[redacted]

WITNESS
NAME PRINTED

[redacted]

NAME:

PHONE NO.

SCHEDULE I

CITY OF EDMONTON — WATER & SANITATION

DUNLUCE/WARWICK & LAGO-LINDO SUBDIVISIONS

SEWER REHABILITATION — PHASE I

1988 LOT REGRADING PROGRAM

OWNER/RESIDENT: [redacted]

ADDRESS: TELEPHONE NO:

REGRADING NECESSARY (SEE ATTACHED SKETCH)

THE FOLLOWING WORK WILL BE UNDERTAKEN TO IMPROVE DRAINAGE AWAY FROM THE HOME:

(a) NORTH SIDE:
① LIFT CONCRETE BLOCKS
(2) FILL UNDER STEP
(3) CUT + LIFT SOD
(4) PLACE + COMPACT FILL
(5) RESET BLOCKS + SOD

(b) EAST SIDE:
① CUT + LIFT SOD
(2) PLACE + COMPACT FILL
③ RESET SOD

(c) SOUTH SIDE:
① CUT + LIFT SOD
(2) PLACE AND COMPACT FILL
③ RESET SOD

(d) WEST SIDE:
① FILL UNDER STEP
(2) PLACE + COMPACT FILL
③ RESET SOD.

(e) MISCELLANEOUS:
2.0 CLAY
16.0 TOPSOIL

Owner's Initial [redacted]

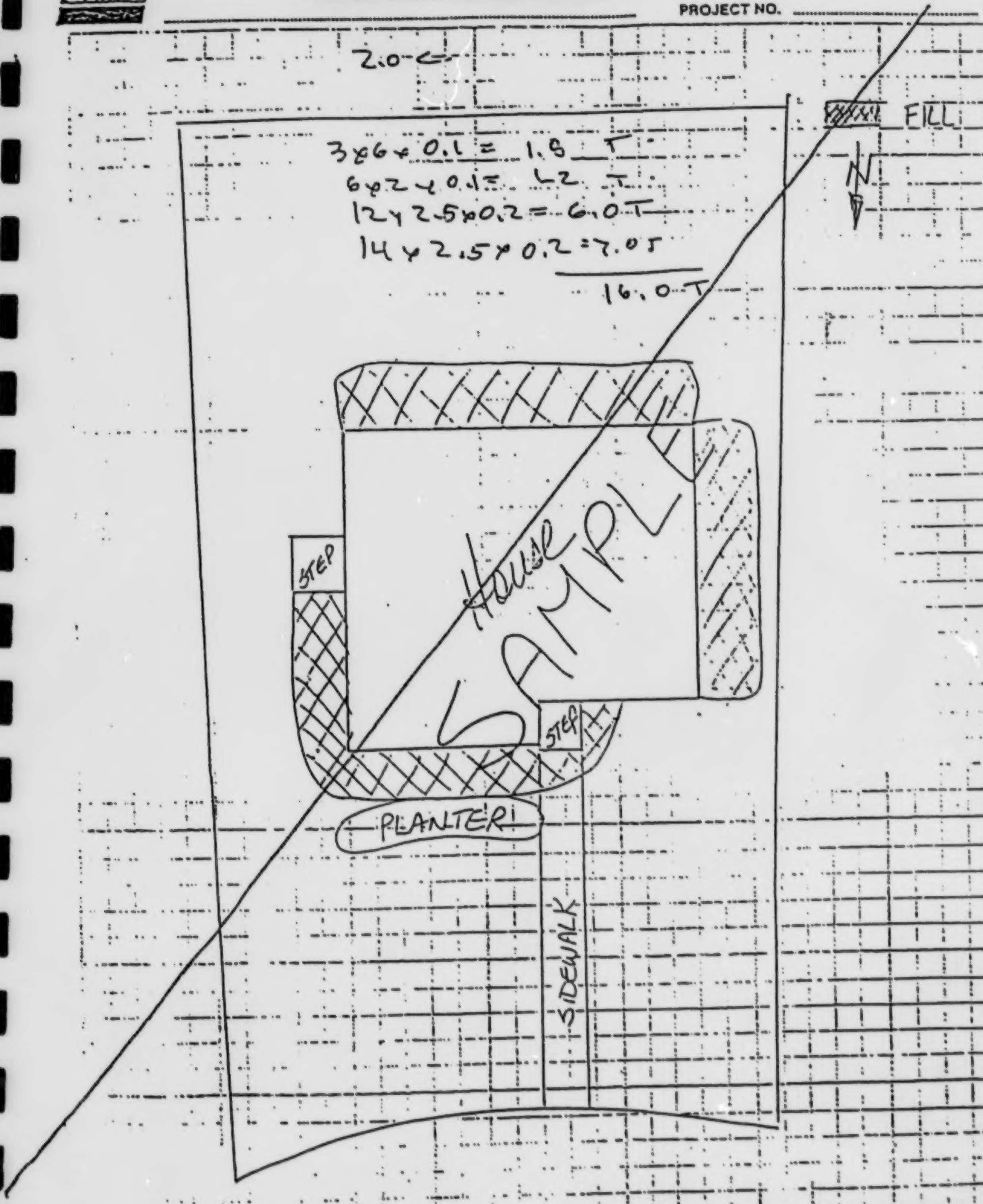
CH2M HILL

SUBJECT Attachment 2 [redacted]

BY KVC DATE

SHEET NO. 1 OF 1

PROJECT NO.


2.0 C
FILL
N
STEP
House
SAMPLE
STEP
PLANTER
SIDEWALK

3x6x0.1 = 1.8 T
6x2x0.1 = 1.2 T
12x2.5x0.2 = 6.0 T
14x2.5x0.2 = 7.0 T
16.0 T

[redacted]

APPENDIX I

CITY, CH2M HILL
TECHNICAL MEMORANDUM #10

CH2M HILL

TECHNICAL MEMORANDUM NO. 10

TO: City of Edmonton

DATE: 1988 December 12

SUBJECT: Dunluce/Warwick and Lago-Lindo
Sewer Rehabilitation
1988 Lot Regrading Program

INTRODUCTION

The investigations into sanitary sewer surcharging in the Dunluce/Warwick and Lago-Lindo subdivisions carried out by CH2M HILL in 1987 identified a number of sources which contribute to the problem. The two main sources identified were:

- Rainfall-dependent I/I through the weeping tile
- Stormwater inflow through manholes in low areas

Deficient lot grading, which directs rainfall toward the perimeter of the houses, was seen to be a significant cause of increased weeping tile flows. A lot regrading program, jointly funded by the City and the Federal Government, was initiated in 1988 May and implemented up to the end of October.

The purpose of this memorandum is to review the 1988 Lot Regrading Program, including its initial concept, development, implementation, and results.

BACKGROUND

Following the issue of the Summary Report, "Sewer Rehabilitation Investigations - Dunluce/Warwick and Lago-Lindo Subdivisions," CH2M HILL was retained by the City for the next phase of the program, "Dunluce/Warwick and Lago-Lindo Sanitary Sewer Rehabilitation - Phase I." As part of this project, CH2M HILL was directed to evaluate the feasibility and cost of the on-lot improvements required.

A total of 135 properties in Lago-Lindo and 53 in Dunluce/Warwick, approximately 10 percent of the total number of lots in the subdivisions, was surveyed as part of this evaluation. These surveys were grouped in parcels of a minimum of three properties to include the drainage effects of adjacent properties.

Costs to implement remedial measures were estimated based on a private contractor doing the work and on work done through a government-subsidized program with the Mennonite Central Committee (MCC) administering the labour.

The average construction costs per lot to the City were estimated as follows:

	Dunluce/ Warwick	Lago-Lindo
Private contractor (Average lot cost)	$1,200	$1,500
Government-funded scheme	$ 700	$ 800

The above costs did not include any allowance for contingency, engineering, or the City's own administration costs. Fill and other material required for the lot grading were to be supplied by the City. Details of this preliminary assessment of lot regrading are contained in CH2M HILL's Technical Memorandum No. 3, Evaluation of On-lot Improvements, 1988 April 18.

The City elected to proceed with the government subsidized lot regrading program with the homeowner contributing approximately 25 percent of this cost. MCC was contracted to provide construction services using recently arrived immigrants as labourers under the direction of MCC's supervisors. CH2M HILL was retained to provide engineering services associated with the program.

IMPLEMENTATION

The 1988 Lot Regrading Program was implemented by CH2M HILL. CH2M HILL personnel delivered a City letter to the residences in Dunluce/Warwick and Lago-Lindo which outlined the proposed program. A door-to-door campaign was mounted which consisted of the following steps:

- Individual lots were evaluated; initially, emphasis was placed on those involved in the sample survey.
- Residents were contacted to inform them of what, if any, deficiencies existed in the lot grading in close proximity of their homes.

- A written proposal which detailed the scope of the work to be performed and established the homeowner's contributions was provided to those homeowners interested in the program (sample form in Appendix TM10-A).
- Homeowners signed the contract which allowed work to commence.

The criteria used in the evaluation of the lots were established based on sufficient drainage away from the home for a distance of 2 m. Sufficient drainage is that which ensures that water from storms does not pond against the house within the distance specified above. The distance requirement was modified in some cases such as when the distance from wall to property line was less than 2 m. In some cases it was necessary to increase this distance to ensure drainage within the 2 m. The work involved on individual lots could consist of any of the following items:

- Filling adjacent to homes - including removing and replacing sod, placing fill material, raising planters, adjusting the grade of concrete sidewalk blocks, constructing wooden retaining structures, and extending and installing window wells
- Excavation - including removal and replacement of sod, excavation to remove high points or to construct swales
- Special tasks - installation of owner-supplied material such as vapour barrier and weeping tile

HOMEOWNER CONTACTS AND CONTRACTS

Homeowners were informed of what work was required and what their cost would be. If they were interested, a contract was drafted with Schedules 1 and 2 outlining the required work. Schedule 1 is a detailed description of the work required and Schedule 2 consists of a plan view sketch of the residence with the work area shaded. CH2M HILL then staked the lot and gave copies of the two schedules to MCC. MCC contacted the owner and informed him/her of when the work would begin.

CH2M HILL maintained the written documentation for the lot regrading program. Files were kept on each lot, documenting any conversations, contracts, and acceptance forms. Copies of a completed contract and an acceptance form were issued to the City for billing purposes. Sample copies of all the forms and documents are enclosed as Appendix TM10-A.

Information trailers were set up in Dunluce/Warwick and Lago-Lindo. The operating hours were from 4:30-8:30 p.m.

for 4 days of the week, 2 in each subdivision. Site visits were recorded in order to measure the effectiveness of this service. A record of site trailer visits is indicated on Figures TM10-1 and TM10-2.

CH2M HILL began obtaining contracts 1988 May 21. A great deal of time was required during the evenings and weekends to put contracts in place because many homeowners work during the day. Initially, CH2M HILL personnel focused on the Dunluce/Warwick area to provide sufficient contracts for the MCC crews to work on. In many instances, residents contacted CH2M HILL while the crews were working on neighboring lots or shortly after the crews left the area.

MCC FIELD ORGANIZATION

MCC's organization was headed by a director who had two supervisors under him. One supervisor handled administrative duties and the other supervisor dealt with the day-to-day requirements in the field. Twenty-seven field personnel were employed. All were recent immigrants. Of the 27 men, three were foremen, each of whom had two lead hands and six labourers to supervise. A typical crew structure consisted of one lead hand and three labourers.

Initially, the equipment available for the MCC crews included two sod strippers, one bobcat, and one truck. An additional bobcat was budgeted for 3 months. During the program, more equipment was obtained to improve productivity. Two additional pickup trucks were rented and the Alberta Vocational Center provided a passenger van for a portion of the program.

The City provided funding for a portion of the equipment and supplies required by the MCC for this program. The following items were provided for in the original budget of $163,000:

- Bobcat rental
- Sod stripper rental
- Computer purchase
- Office rental, furniture, supplies
- Telephone

The City also provided additional funds to implement waste removal and for the purchase of more hand tools and equipment.

CONSTRUCTION

MCC crews began work in Dunluce/Warwick on 1988 June 1. At that time, nine contracts were in place. The City supplied clay, topsoil, sand, washed rock, and gravel. Other materials, such as window wells, sod, and timber, were purchased by MCC as the need arose. These materials were extra costs to the budget and the City reimbursed MCC for the items.

The City also provided several trailers for MCC to store tools and equipment overnight. These trailers were located near the main material stockpile sites in each subdivision.

The MCC field supervisor coordinated material supply with City sources. The time for delivery varied but in general the response time was 2 days from an MCC request. Arrangements were also made to dump material in small loads at individual regrading sites. Typically, MCC contacted the homeowners 2 to 3 days before beginning work on a lot. The size of crew on a particular lot depended on the amount of work to be done.

MCC crews used the two schedules attached to the contract as well as the staking done by CH2M HILL to perform the work. CH2M HILL personnel provided inspection services as per the agreement and were available to assist MCC in interpretation of the schedules.

OTHER FEATURES AND COMMENTS

Scheduling of Contracts

Scheduling of materials and crews was determined by MCC's field supervisor. MCC began work on sample survey lots first as these were the first homeowners approached by CH2M HILL to enter into the program. These lots were scattered due to the nature of the sample survey. CH2M HILL revised its approach and attempted to obtain contracts in a more grouped or clustered setting. This was partially successful.

MCC began concentrating on regrading lots within the clustered areas. This meant that some homeowners had to wait for a considerable time from when they signed contracts until the work was completed.

Status sheets were developed by CH2M HILL to record the progress of the program with respect to CH2M HILL contracts and MCC's progress. A sample status sheet is included in Appendix TM10-A. These records were updated on a daily basis. Figure TM10-3 is a graphical illustration of the rate of contracts signed and the progress rate of the crews.

MCC crews initially worked in Dunluce/Warwick. On 1988 June 22 approximately one third of the crews moved to Lago-Lindo. At this time, 20 lots had been regraded in Dunluce/Warwick. In the week of 1988 September 12, the balance of the crews relocated to Lago-Lindo because the 78 contracts available in Dunluce/Warwick had been completed. Some crews returned to Dunluce/Warwick in the week of 1988 October 10 to regrade eight lots whose owners had signed contracts subsequent to crew relocation.

Crew Productivity

MCC productivity during the startup phase was considerably lower than projected. Much of the reduction in progress for the first few weeks was due to both the MCC crews' need to meet Federal Government requirements for training and to the lack of practical experience on the part of the MCC labourers. Other items identified as contributing to lowered productivity included:

- MCC crew mobility
- Scattered lots (partially attributed to concentrating on the sample survey)
- Material supply and stockpile locations
- MCC crew requirements for language classes (approximately one half day, twice a week)

The City responded by providing funding for extra tools and equipment and for hiring extra labour. The additional labourers began work on 1988 September 26. CH2M HILL attempted to obtain contracts in a more clustered arrangement. MCC was able to arrange for extra vehicles which allowed the foremen more mobility, reduced waiting time for some materials, and allowed the field supervisor to more closely monitor the onsite work.

Productivity increased significantly towards the end of the program in terms of number of lots regraded. This was the result of several factors, including:

- Lots in clusters
- Improvement in crew mobility
- Extra labourers
- Crews worked overtime to ensure they would fulfill their alloted work time
- MCC arranged for crews to attend language classes early Friday mornings rather than two afternoons a week.

Meetings

Regular progress meetings were attended by the City, MCC, and CH2M HILL. These meetings were originally scheduled biweekly but were changed to a weekly schedule towards the end of the program.

Progress, problems encountered, and other topics were reviewed. All parties were able to bring items of concern to attention at these meetings. This helped to more efficiently resolve any issues that occurred.

Work Verification and Deficiency Correction

Upon completion of the regrading work, CH2M HILL verified the work and if all was deemed in order, provided the homeowner with an acceptance form to sign and return. In addition, a City form requesting comments was supplied.

In the cases where incorrect or deficient work was noted by CH2M HILL or through legitimate homeowner complaints, MCC was instructed to return to the lot and correct the items. In a number of cases the work required was marginal but carried out as a goodwill gesture to reduce the likelihood of future complaints.

The state of finished lots deserves mention. In the majority of cases, the lots were left in a significantly improved state. Sod replacement often entailed new material which was nearly always superior to existing conditions. Comparison photos of before and after construction for typical lots are in Appendix TM10-B.

It should be noted that this project essentially consisted of 287 separate contracts. The end result was that approximately 98 percent of homeowners who had their lots regraded under the program signed their acceptance forms. A City representative removed from the daily operations of the program made contact with several owners who refused to sign after repeated attempts by CH2M HILL to resolve the items.

None of the owners agreed to sign, and at the City's request CH2M HILL again attempted to negotiate a settled contract price. CH2M HILL provided the City with recommended billings for the owners who refused to sign.

Impact of Climate

Effective construction ceased in the week of 1988 October 24, partially due to the nonavailability of sod. Two additional lots were regraded during the week of 1988 October 31. MCC crews spent a great deal of the last weeks working on rectifying deficiencies. The City provided funding to have a crew of two foremen and two labourers available for 1 week after the program ended on 1988 November 4 to finalize deficiencies and for final cleanup.

Toward the end of the program regrading contracts were conditional on weather. Homeowners were informed of this and an appropriate clause included in their contract. Regrading was not carried out due to weather constraints on 10 lots for which contracts were signed.

Relationship of Lot Grading to Reported Basements Flooded On 1988 July 5/6

A brief analysis was carried out to review participation of those residences that flooded on July 5/6 in the lot regrading program. Table TM10-1 is a tabulation of the data based on residences with 76 percent and greater deficient lot grading.

Table TM10-1
INCIDENCE OF REPORTED FLOODING/LOT CONDITION

	Dunluce/Warwick		Lago-Lindo	
	% of Bad Grading		% of Bad Grading	
	76-99%	100%	76-99%	100%
Number of Lots with >75% Bad Grading				
Before 1988 Lot Regrading Program	31	11	81	38
After 1988 Lot Regrading Program	17	5	56	26
Reported Flooded During the July 5/6 Storm	9	1	8	1
Regraded in 1988	14	6	25	12
Both Flooded and Regraded in 1988	7	0	6	0
Percentage of Bad Lots Reported Flooded	29	9	10	3
Percentage of Bad Lots Regraded	45	55	31	32
Percentage of Bad Lots Flooded and Regraded	23	0	7	0

COST SUMMARY

Upon completion of the 1988 Lot Regrading Program, 287 lots had been upgraded. Of these 86 were in Dunluce/Warwick and

201 in Lago-Lindo. Two hundred and eighty-two acceptance forms were signed and the remaining five were forwarded to the City with billing recommendations. Figure TM10-4 shows the locations of lots regraded in Dunluce/Warwick and Figure TM10-5 shows the locations of lots regraded in Lago-Lindo.

Based on the lot evaluation survey described in Technical Memorandum No. 6, Figures TM10-6 and TM10-7 have been provided to show the change in lot grading status as a result of the lot regrading program in Dunluce/Warwick and Lago-Lindo, respectively. It must be recognized that as these figures are based on the lot evaluation survey, the criteria for deficient lot grading vary somewhat (See TM-6). Figures TM10-6 and TM10-7 represent the net effect of lot grading.

MCC billed a total of $189,330.85. Of this, $300.00 was held back by the City to cover minor damages or losses to homeowners. It should be noted that the original contract with MCC was for $163,000. Change orders were issued to cover additional items which included extra tools and equipment, extra labour, and waste removal services. Homeowners' contributions totalled $57,950.50. Table TM10-2 shows a per lot cost breakdown based on MCC billing and owner contributions. Table TM10-3 is a summary of total project construction costs.

As previously discussed, it was proposed that the homeowner should pay 25 percent of the cost of regrading. Based on the estimates detailed in the "Background" section of this memorandum, this was to be approximately $200 for the average lot.

The costs to the homeowner were therefore assessed using a base cost of $100 per side regraded ($200 for two sides as an average case). Each lot was individually assessed prior to providing the homeowner a cost estimate. In the assessment, the costs for regrading all sides requiring work were factored based on the degree of difficulty. The contracts ranged from $60 to $130 per side, depending on the degree of difficulty and the amount of work required.

Table TM10-2
LOT REGRADING COSTS

	TOTAL (287	D/W (86)	L-L (201)
MCC Billing	$189,030.85	$56,643.39	$132,321.46
Homeowner Contributions	$ 57,950.50	$18,872.50	$ 39,078.00

Table TM10-3
TOTAL CONSTRUCTION COSTS

	TOTAL	PER LOT
MCC Billing to the City[1]	$189,030.85	$ 658.64
Extra City Costs[2]	26,412.00	92.03
Subtotal: City Costs	215,442.85	750.67
Federal Government Funding[3]	168,000.00	585.37
TOTAL COST OF REGRADING CONSTRUCTION	$383,442.85	$ 1,336.04
LESS: Homeowner Contributions	57,950.50	201.92
SUBSIDIZATION COST	$325,352.35	$ 1,134.12

Notes:

1. Includes reduction to MCC to pay for damages.

2. These are costs incurred to provide additional material and do not include internal City costs.

3. Estimated costs provided by MCC.

CONCLUSIONS

1. Successful implementation of on-lot I/I reduction measures requires thorough planning of owner contacts and maintenance of good owner relations. The lot regrading program benefitted significantly from the pre-implementation planning carried out by the City and CH2M HILL.

2. Working evenings and weekends has to be recognized as a integral part of implementing such a program.

3. Lack of sufficient lead time between the approval of the program and the start of construction reduced flexibility in program implementation and adversely affected crew productivity as lots tended to be scattered.

4. Based on surveys carried out in 1988 September, the program corrected the most serious lot grading deficiencies in both subdivisions.

5. RDI/I into the weeping tiles will be reduced at the homes where the regrading was carried out. Based on calculations and experience elsewhere (Winnipeg), this

reduction is significant and will contribute to the overall rehabilitation program in Lago-Lindo and Dunluce/Warwick.

6. The average construction cost per lot was $1,336.04. Of this 41 percent was covered by the City, 44 percent by Federal Government subsidy, and 15 percent by homeowner. These figures do not include City administration and engineering costs.

7. The government-subsidized program, as implemented, had important advantages in the execution of the work:

   - Reduced cost
   - MCC organization that was sensitive to homeowner requirements
   - Social benefit in that the program facilitated training and upgrading of skills of recently arrived immigrants

8. No conclusion can be drawn as to the relative costs that would have been incurred if private contractors had been used to implement the program.

9. The monetary level of assistance provided by the City was adequate to promote the program. In general, the contribution requested from the homeowner was not a deterrent to implementing the work.

RECOMMENDATIONS

1. The City should consider similar lot regrading programs as an effective I/I reduction measure in areas where serious grading deficiencies exist.

2. The lot evaluation study of both subdivisions should be used to assess the need for continuing the regrading program in Dunluce/Warwick and Lago-Lindo. Consideration should be given to completing the 10 lots for which agreements were signed.

3. In implementing future programs, a lead time of 1-2 months should be allowed between approval and start of construction.

4. If costs for implementation by private contractor and government-subsidized program need to be compared, a parallel program using private contractors should be carried out.

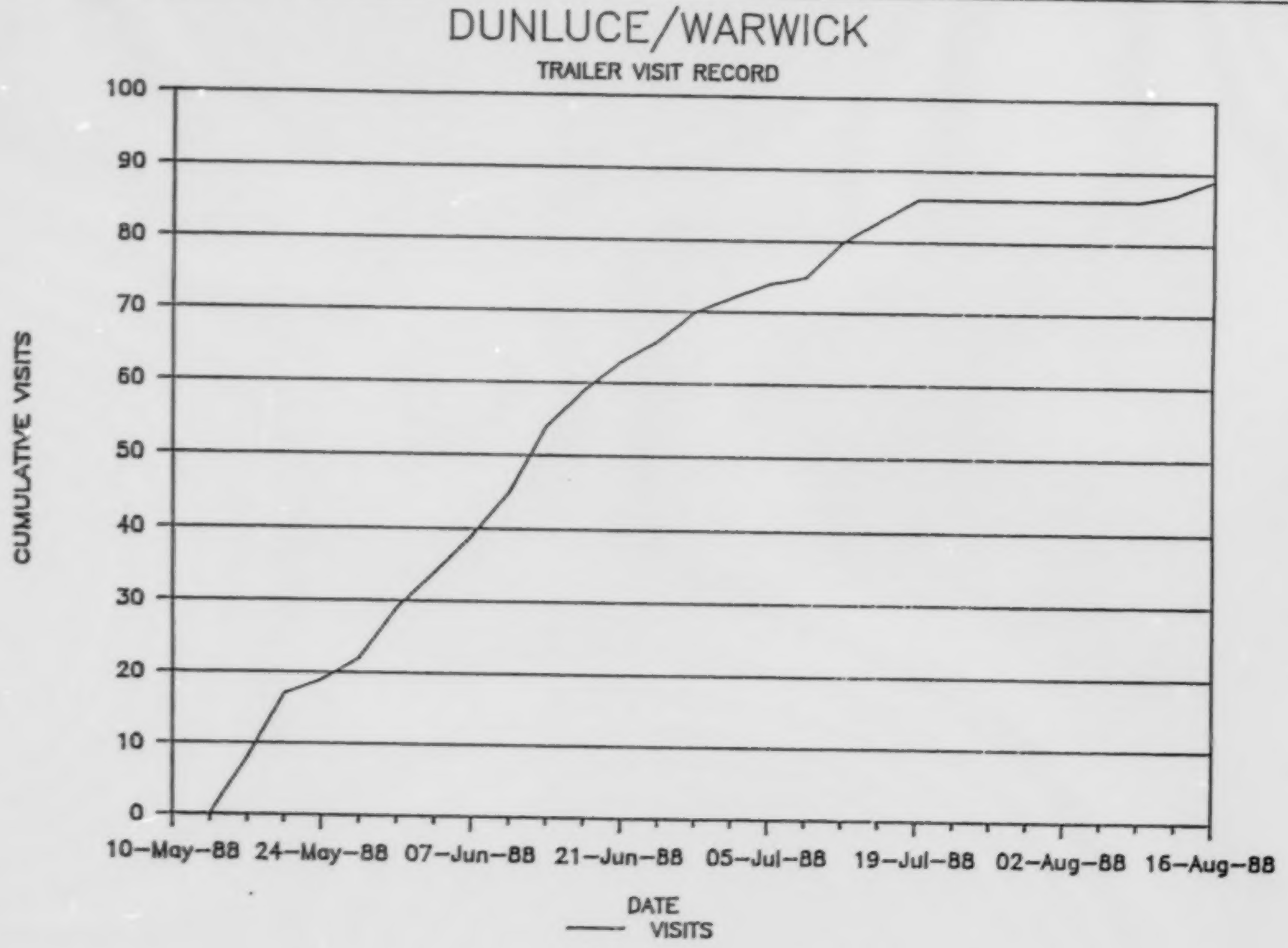


Figure TM10-1

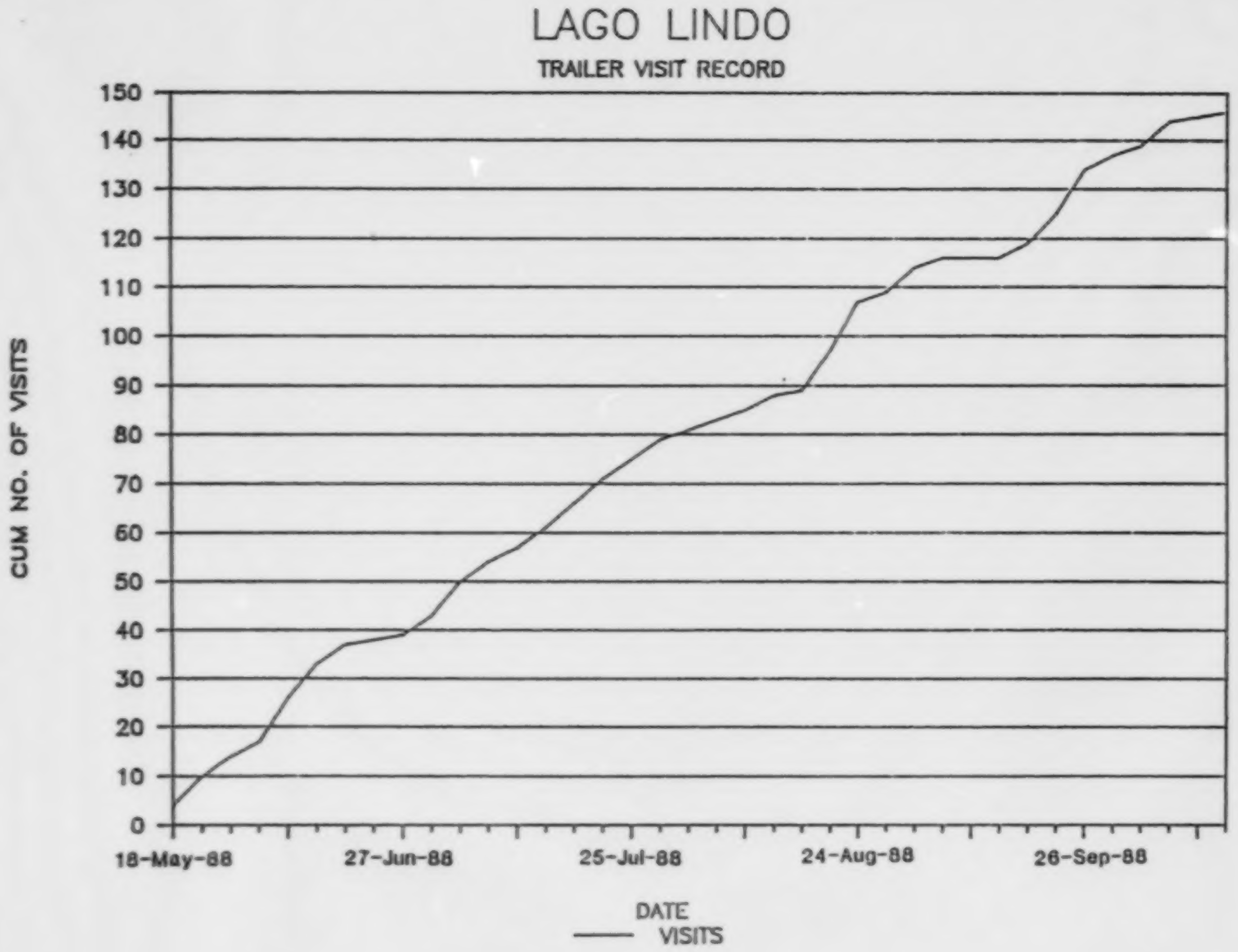


Figure TM10-2

CH2M HILL

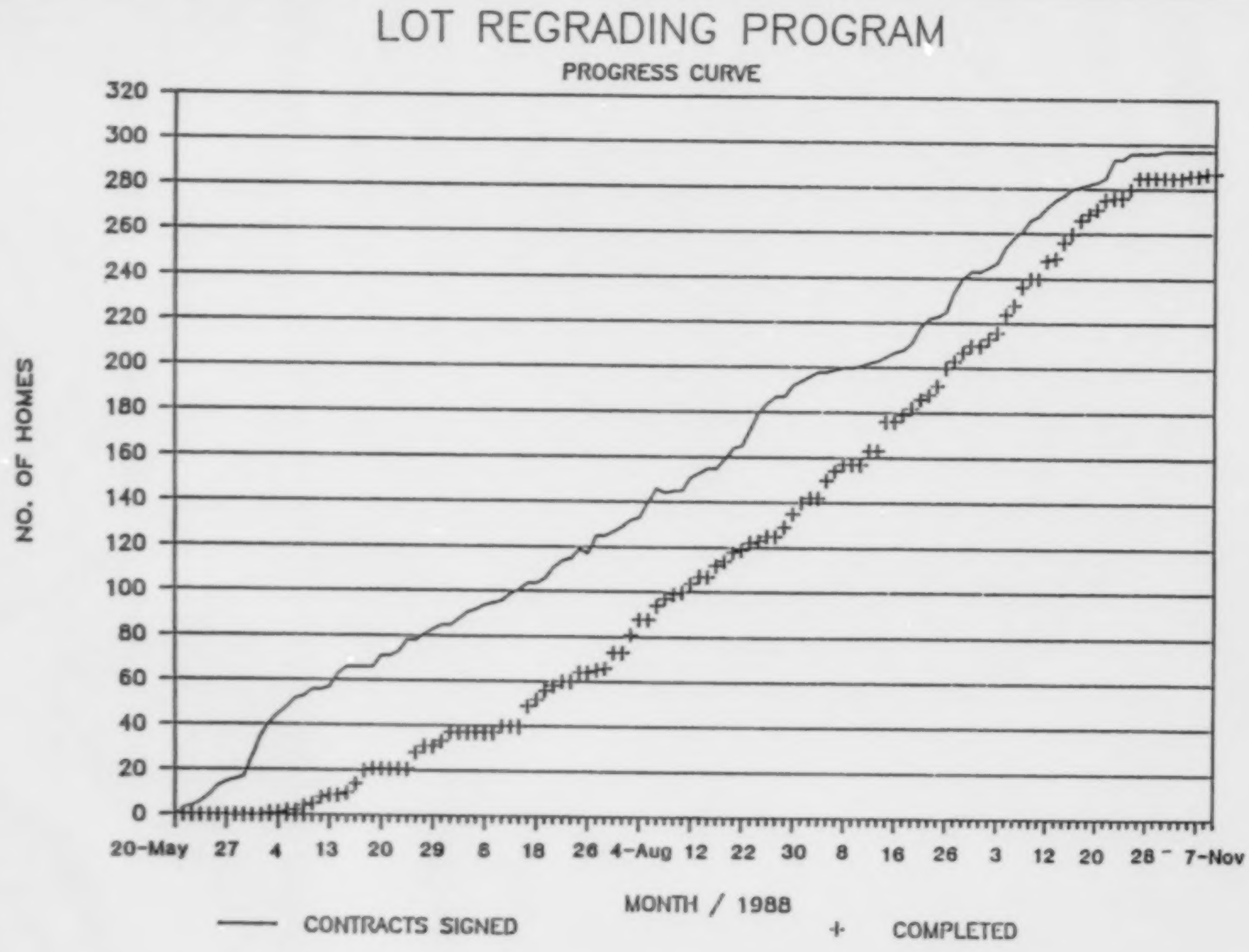


Figure TM10-3

APPENDIX J

CITY LETTER TO HOUSEHOLDERS 1989

THE CITY OF Edmonton ENVIRONMENTAL SERVICES

3RD FLOOR, WEST CHAMBERS
12220 STONY PLAIN ROAD
EDMONTON, ALBERTA
T5J 3Y4

May 17, 1989

File No: 51-021-799-790

Dear Homeowner:

SUBJECT: DUNLUCE/WARWICK AND LAGO LINDO LOT REGRADING PROGRAM

I am writing to inform you that our Department is continuing this year with the lot regrading program in your area as part of our plan to alleviate the basement flooding problems previously experienced by residents in Dunluce/Warwick and Lago Lindo subdivisions. As in last year, the work will be done by the Mennonite Central Committee. The costs will be shared by the City of Edmonton, the Federal Government and the participating homeowners. The homeowners' share will be limited to 20 per cent of the total costs. Each homeowner will be informed of his share prior to acceptance of our proposal and the amount will depend on the extent of work required. Based on last year's experience, the average cost to a homeowner is approximately $200.

As a result of our lot evaluation survey done last year, your lot has been identified as one of those that have grading deficiencies. Such deficiencies will contribute to the overloading of the sanitary sewers during rainy weather and may be harmful to your house with seepage and basement flooding as a likely consequence. This program is an opportunity for you to protect your home against this potential problem at very little cost.

If you are interested in the lot regrading program, please phone me at 428-3517 and I shall arrange to have our staff contact you for an explanation of our proposal. A written proposal with details will be prepared for your acceptance prior to the commencement of the work.

I thank you for your cooperation to date and I hope you will participate in the lot regrading program. Your participation will be beneficial to yourself as well as to other homeowners in your neighbourhood.

Yours truly,
ENVIRONMENTAL SERVICES

FRANCIS WU, P. Eng.
SENIOR ENGINEER
DRAINAGE CAPITAL PROJECTS

FW/mvp

APPENDIX K

CITY ADVERTISEMENTS AND PAMPHLETS

Keep Your Basement Dry This Summer

A Quick Guide to Effective Home Drainage

1. Downspout Drainage - [illegible]
2. Lot Grading - [illegible]
3. Backflow Valve - [illegible]
4. Your Neighbours - [illegible]

* [illegible]

For advice or a free home inspection** phone:

** [illegible]

428-5061

[illegible]

Edmonton

K1

How To Keep Your Basement Dry This Summer

A Quick Guide to Effective Home Drainage

Help Protect Your Home &
Help Protect Our Environment!

IT CAN HAPPEN ANYWHERE

Into every life, it is said, a little rain must fall. Yet Edmonton only gets about 345 millimetres (14 inches) of rain annually, most of it from May to October. Problems in Edmonton are [illegible] all or [illegible]. When a major rainstorm hits, basements can flood anywhere in Edmonton. In 1988 one storm alone flooded more than 1,100 basements — all over the city.

IT'S UP TO ALL OF US!

A municipal drainage system just can't guarantee basement flood protection to every house in the city.

Building a new drainage system that guarantees protection against every possible storm is a huge task.

An individual homeowner, however, can take steps to reduce the likelihood of flooding.

Here's the best part: if every Edmonton homeowner took these steps, the strain on the City's drainage system during a major rainstorm would be greatly reduced. When your neighbours join you in doing their part, there's less chance your basement will flood due to an overload in the drainage system.

[illegible] could also reduce the amount of combined sewer overflow dumped into the North Saskatchewan River during a major storm.

By making your home's drainage efficient, you can help save millions in tax dollars and protect the environment. Happily, you'll also help protect your own property!

WHY YOU WANT TO PROTECT YOUR BASEMENT

A flooded basement is more than just a nuisance. Renovation of a flooded basement can cost thousands. Even an unfinished basement takes time and money to clean up. There's also the unpleasant business of living above a basement that smells like old sneakers.

THREE WAYS TO STAY DRY

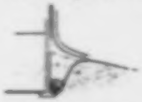
Apart from cracks in the foundations, basements get flooded in a storm for two reasons:

- too much water drainage too quickly into the weeping tile directly under a basement, overloading the home's drainage.
- back up in area properties due to an overload in your neighbourhood drainage system.

To prevent a flooded basement, therefore, you want to make sure your property is draining properly, try to prevent any back-up from coming into your basement, and encourage your neighbours to do the same.

Here are three steps that will help prevent basement flooding. Note: these steps alone don't guarantee a dry basement!—to keep the system from overloading in a storm, everybody has to pitch in.

1. Downspout Drainage

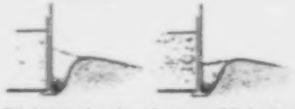


Water pours off your eavestroughs into downspouts—but where do the downspouts take all that water?

If the downspouts are dumping the water right beside your foundation, it drains directly to the weeping tile and can easily overload your home's drainage.

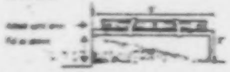
Make sure downspouts extend at least 1.5 metres (five feet) from your basement wall. Also, be sure the water doesn't drain toward your neighbour's basement walls. It should drain away from your house toward the street or back lane.

2. Lot Grading



If the land around your home slopes in toward the foundation, rainwater heads right for the weeping tile under the basement and can overload your home's drainage system. The land around many homes settles over time, and then slopes in toward the foundation.

Check your lot grade with an easy-to-build slope gauge (see illustration).



If your lot slopes inward, you'll want to fill in and grade the lot so that, for at least 1.5 metres out from around the foundation, the land slopes away from your house. Why not get the fill and soil you'd need for this task when you buy and [illegible] for gardening or landscaping?

3. Backflow Valve

If your home drainage system or the neighbourhood's drainage system overloads, you may still be able to prevent rain water and sewage from backing up into your basement by installing a backflow valve.

Up to $250 Tax Credit

The City of Edmonton offers tax relief equivalent to half the cost—to a maximum of $250—to each owner who installs a sewer backflow prevention device. (This rebate applies only to homes constructed prior to July 1988.) Senior citizens who do not have taxes payable can receive a credit on utility bills.

Note: a plumbing permit is required for installation of a backflow valve—call 428-5730 for an application.

TALK TO YOUR NEIGHBOURS

If everyone in your neighbourhood has good home drainage, it's less likely your area drainage system will overload in a storm.

It's especially important to you that your immediate neighbours don't have water draining from their lots or downspouts directly toward your basement.

Talk with your neighbours about drainage. Explain why it's important to you and to everyone in Edmonton. Show them this ad.

FREE HOME INSPECTIONS!

The City of Edmonton is offering home drainage advice. And until June 11, 1988 you can even request a free home inspection.

If you're not sure how to place your downspouts or grade your lot, City inspectors will do a free check and indicate the steps needed to improve your home's drainage. If you need this assistance, act now—inspections are available only until *June 11*.

For advice or a free home inspection phone:

428-5061

(Mon. to Fri. 8:30 - 4:30 PM)

Edmonton ENVIRONMENTAL SERVICES

Printed on Recycled Paper

The Problem Today

Edmonton's sewer system is at a critical point. Additional development can no longer be accommodated by an already at-capacity system. When design engineers plan new sewer systems, they naturally allow for extra capacity to accommodate future development. But the "extra capacity" that was built in the early 1900's, in the older and central part of the city, is already used-up. Yet new development around the city's perimeter keeps connecting into this at-capacity system to dispose of its sewage either at the Gold Bar Plant, or by overflowing into the river during periods of heavy rainfall. This new development cannot continue indefinitely; at some point street and basement floodings reach an intolerable level. In Edmonton, that point is now in some areas.

Further complicating this problem is the fact that rainwater in the ground seeps through the cracks and joints of sanitary pipes, placing an even greater load on the system. As well,

What You Can Do

As a resident, you can significantly contribute to the solution of this problem by:

1) extending your roof downspout well away from your house so water doesn't run down along your foundation;
2) ensuring your lot grading slopes away from your foundation, in all directions;
3) installing a backflow prevention device into your sanitary service (the City subsidizes this installation up to $250. Call 428-5730 for further details); and
4) submitting your written or verbal input to a major study the City has initiated (details follow).

What the City is Doing

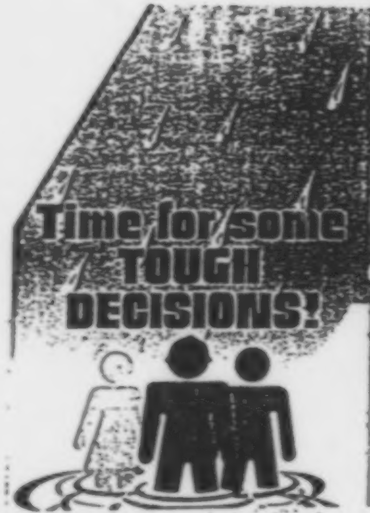
Environmental Services has appointed a task force to analyse the City's entire drainage system and make recommendations for improvement by the end of 1989. This is a huge and difficult mandate, and the task force needs your help.

Or, if you wish direct input, we invite you to be a member of an advisory group representing the general public. The time commitment would be approximately one evening meeting in February and one in June. If interested, call 428-2722 and leave your name and phone number.

The task force will select public input from two other advisory groups, one representing community leagues and another representing recently flooded homeowners.

Edmonton's drainage problems will not disappear on their own. The system that has been out-of-sight and out-of-mind for so many years, now needs our immediate attention. Together, we can find solutions.

For further information, call 428-2722.



FOLLOW
THE
FLOW

FOLLOW THE FLOW

Sewer service is one of the most extensive and expensive services that a municipality provides for its citizens. Yet few understand the basic way our drainage system works.

Your Sewer System

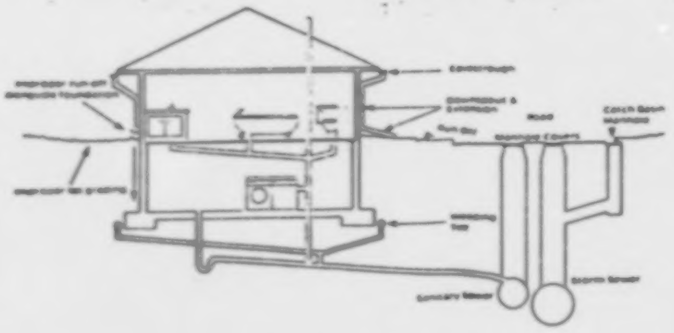
Let's start in your home. There are two kinds of wastewater, sanitary and storm. Sanitary is the wastewater that comes from your dishwasher, bathtub, toilet - all the water you use and make dirty. Also flowing into the sanitary lines is rainwater collected by your weeping tile, which is a system of porous pipes that lie around the outside, bottom of your house foundation. This weeping tile system collects and removes the rainwater that seeps down your foundation, to prevent leaking into your basement. It also removes any water that may be coming from high ground water levels.

The second kind of wastewater is stormwater. All the water that falls in a rainstorm should be drained away safely. The ground, much of which has been covered with buildings and concrete, cannot absorb all the rainwater. Rainstorms drop huge volumes of water. For example, just 10 mm of rain on the roof of your 120 sq. m (1300 sq. ft.) house equals 1300 litres of roof runoff.

This roof runoff is directed into the stormwater system in one of two ways, through downspouts connected directly to the stormwater sewer, or through downspouts that are extended well away from the house which then allows the water to drain into street or alley receptacles.

Obviously, a serious problem would exist if your downspout drained immediately beside your house. This huge amount of water would seep down into your weeping tile, overloading it or even helping to overload the main sanitary line under the street. In either case, water in your basement is a real possibility, whether it seeps through foundation cracks or backs-up through your sanitary line. The very same danger would exist if your lot grading sloped towards your house.

Below is a diagram of the sewer system in a typical house and how it connects to the main City system. (On the left is improper downspout drainage and lot grading.)



The City's Sewer System

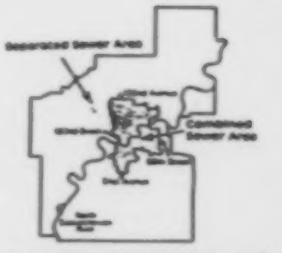
When your wastewater leaves your property, it enters the main City system under your street or alley. This City system is extensive; 4,000 km of mains criss-cross beneath our feet. There are actually three separate City systems.

The first collection system was built in the early 1900's when Edmonton started growing in population. This system used large pipes which carried both sanitary sewage and stormwater. Today we call this system, which serves the central, older part of the city, the combined system. This sewage flows to the Gold Bar Wastewater Treatment Plant where it is treated (cleaned) before being returned to the river.

In the 1950's the City started building two separate systems under the streets, one to carry sanitary sewage and another to carry stormwater. The sanitary goes to the Gold Bar Plant, for treatment, while the stormwater is drained directly to the river.

The City map above right outlines the combined area and the separated area.

Building new and bigger sewer mains is very expensive. Another way of handling the water from huge rainstorms is to build stormwater management ponds. When the drainage pipes are filled to capacity, rainwater overflows into these man-made ponds for temporary storage. When the storm ends and the pipes again have capacity, these lakes slowly drain back into the system.



It is possible to design and build a sewer system so large and extensive that it will handle new development indefinitely, and any rainstorm no matter how big it is. But this is not an economically responsible thing to do. A community has to draw the line somewhere and agree to live with a certain level of risk. All residents of urban communities must realize their sewer systems cannot give a 100 per cent guarantee of no surface or basement flooding. The difficult part, of course, is deciding what is an acceptable level of risk, and what is not.

APPENDIX L

CITY BY-LAW NO. 9198

BYLAW NO. 9198

Minimum Property Standards Bylaw

WHEREAS the Municipal Government Act, R.S.A. 1980, Chapter M-26, as amended, in Section 248 provides in part as follows:

(1) A Council may by Bylaw establish and enforce minimum standards for existing property in the municipality.

(2) The Bylaw may:

(a) Prescribe standards for the maintenance and occupancy of property and prohibit the use of property that does not conform to the prescribed standards, and

(b) Require property that does not conform to the prescribed standards to be repaired and maintained to comply with the standards or the land thereof to be cleared of all buildings and structures and left in a graded and level condition;

AND WHEREAS the Municipal Council of the City of Edmonton wishes to establish and enforce minimum standards for existing property within the City of Edmonton;

NOW THEREFORE the Municipal Council of the City of Edmonton duly assembled enacts as follows:

PART I - ADMINISTRATION

1. TITLE

This Bylaw shall be known as The Minimum Property Standards Bylaw.

2. DEFINITIONS

Accessory Building - means a detached subordinate building on the same property as the main building.

Approved - means acceptable to the 'Inspector'.

Barrier - means a protective device that acts as a guard around openings in floors or at the open sides of stairs, landings, balconies, mezzanines, galleries, raised walkways, or other locations to prevent accidental falls from one level to another. Such barrier may or may not have openings through it.

Building - means any structure used or intended for supporting or sheltering any use or occupancy.

City - means 'The City of Edmonton'.

Code - means the regulations of the Uniform Building Standards Act.

Development Appeal Board - means the Development Appeal Board established by the Municipal Council of the City.

Development Control Officer - means the General Manager of the Planning and Development Department of the City.

Dwelling Unit - means one or more self-contained rooms provided with sleeping and cooking facilities, intended for domestic use, and used or intended to be used permanently or semi-permanently as a residence.

Fire Resistance Rating - means the time in hours or fractions thereof that a material or assembly of materials will withstand the passage of flame and the transmission of heat when exposed to fire under specified conditions of test and performance criteria or as determined by extension or interpretation of information derived therefrom.

Habitable Room - means any room in a dwelling unit other than a non-habitable room.

Inspector - means an inspector appointed pursuant to Section 4 of this Bylaw.

Means of Egress - means a continuous path of travel provided by a doorway, hallway, corridor, exterior passage way, balcony, lobby, stair, ramp or other egress facility or combination thereof for the escape of persons from any point in a building, floor area, room, or contained open space to an open public thoroughfare or to an exterior open space protected from fire exposure from a building and having access to an open public thoroughfare.

Non-Habitable Room - means a space in an dwelling unit providing a service function and not intended for human occupancy, including bathrooms, entry ways, corridors, or storage areas.

Occupancy - means the use or intended use of a building or part thereof for the shelter or support of persons, animals or property.

Sewerage System - means all construction for collection, transportation, pumping, treatment and final disposal of sewage, or any part thereof, within the City.

3. APPLICATION

All property within the City shall comply with the standards prescribed in this Bylaw.

4. OFFICERS AND INSPECTORS

(a) the City authorizes the Development Control Officer to be responsible for the administration of this Bylaw.

(b) to assist in the administration of this Bylaw, the Development Control Officer may from time to time appoint Inspectors.

(c) each Inspector appointed pursuant to Subsection (b) shall be issued an identity card.

5. RIGHT OF ENTRY

(a) an Inspector may only enter land or a building if:

(i) The owner or person in possession of it gives his consent to the entry, or

(ii) The entry is authorized by an Order of the Court of Queen's Bench pursuant to Subsection (b),

and then only for the purpose of insuring compliance with this Bylaw.

(b) If an Inspector

(i) cannot obtain consent to enter land or a building or

(ii) having received consent to enter land or a building is obstructed or interfered with in any way, he may apply to the Court of Queen's Bench by way of Originating Notice for an Order

(iii) authorizing his entry, or
(iv) withstraining any persons from preventing, interfering with or obstructing an Inspector from entering the land or a building

or both.

(c) If the Judge of the Court of Queen's Bench is satisfied that:

(i) the person applying for an Order pursuant to Subsection (b) is an Inspector, and
(ii) the Inspector needs to enter the land or a building to determine whether the Bylaw is being complied with.

he may make an order pursuant to Subsection (b).

(d) A copy of the Originating Notice and a copy of each Affidavit in support shall be served not less than three days before the day named in the Notice for hearing the application.

6. ENFORCEMENT

(a) This Bylaw shall be enforceable with respect to property when notice has been sent by registered mail to or served on the assessed owner and all persons shown by the records of the Land Titles Office to have an interest in the property and on the occupant, if any, which notice shall state the following:

(i) the property does not comply with the standards prescribed in Part II of this Bylaw and that repairs are required to be made to it, giving reasonable particulars of the repairs required to be made, or that the land must be cleared and left in a graded and level condition;

(ii) the time within which the repairs are to be made or the clearing is to be done, which shall not be less than 2 months;

(iii) if the repairs or clearance are not so done within the time specified, the City may carry out the repair or clearance and the costs of the work done may be levied against the property as a debt due to the City or charged against the land concerned as taxes due and owing in respect of that land and recovered as such.

(b) (i) As an alternative to the City carrying out the repairs or clearance, the persons entitled to notice under section 6 who did not carry out the repairs or clearance within the time specified in the notice may be issued an offence ticket by an Inspector in the amount specified in Schedule "A" hereto, or a summons imposing a maximum fine of $2,500.00.

(ii) The provisions of Bylaw 7083, a Bylaw to provide for the Imposition of Penalties For Infractions of City Bylaws, as amended, insofar as those provisions relate to the issuing of offense tickets as an alternative and in lieu of a summons, shall apply to the issuing of offense tickets under this bylaw.

(iii) Each day of violation of any provision of this bylaw shall constitute of seperate offense.

7. **APPEALS**

(a) a person entitled to notice under Section 6 may, within 14 days of the receipt of the notice, appeal to the Development Appeal Board.

(b) the Development Appeal Board shall hold a hearing of each appeal and in determining the appeal it may:

(i) confirm, reverse or vary the decision appealed from, and

(ii) grant an extension of not more than one year from the end of the time specified in the notice given under Section 6 within which the repairs are to be made or the clearing is to be done,but no extension shall be granted unless the Development Appeal Board is of the opinion that a refusal of the appeal would result in undue hardship and not more than two extensions may be granted in respect of any property.

PART II - STANDARDS

8. **DRAINAGE**

(a) No roof drainage shall be discharged on sidewalks, stairs or neighboring property.

(b) All lots shall be maintained such that water will not accumulate at or near a building.

(c) All roof drain down spouts which are not connected to a sewer shall be maintained such that soil erosion is prevented.

(d) If the City has adopted a surface drainage plan for a particular area, the grade of all lots within that area shall be maintained in conformance with the said surface drainage plan.

9. **STEPS, WALKS & DRIVEWAYS**

Steps, walks and driveways shall be maintained to afford safe passage under normal use.

10. **FENCES**

Fences, barriers and retaining walls shall be kept in good repair.

11. ACCESSORY BUILDINGS

Accessory buildings shall be maintained in good repair.

12. FOUNDATIONS

Foundation walls and basements, cellars or crawl space floors shall be maintained in good repair in accordance with the Code and in a structurally sound condition which shall, where necessary, involve the shoring of the walls, installing of subsoil drains at the footings, the grouting of masonry cracks, and the parging and waterproofing of walls and floors.

13. STRUCTURALLY SOUND

Every part of a building shall be maintained in good repair in accordance with the Code and in a structurally sound condition, capable of sustaining safely its own weight and any load to which it may be subject. Materials which have been damaged or show evidence of rot or other deterioration shall be repaired or replaced.

14. EXTERIOR WALLS

(a) Exterior walls and other parts of a building shall be free from loose, warped and broken materials. Such materials shall be removed, repaired or replaced.

(b) Exterior walls and their components shall be maintained to prevent their deterioration due to weather, rot and insects, and shall be so maintained by painting, restoring or repairing walls, coping or flashing and by waterproofing joints where required.

15. ROOFS

(a) A roof shall be free from loose, warped and broken materials Such materials shall be removed, repaired or replaced.

(b) A roof, including its facia board, soffits, cornice and flashing shall be maintained in a watertight condition to prevent leakage of water into a building.

16. DOORS AND WINDOWS

(a) All windows and exterior doors shall be maintained in good repair and weather proofed to prevent the entrance of wind or rain into a building.

(b) Latching and locking devices on exterior doors and windows shall be maintained in good working order.

17. STAIRS AND PORCHES

Inside or outside stairs or porches shall be maintained in good repair and all treads, risers or supporting structural members which are rotted or deteriorated shall be repaired or replaced.

18. EGRESS

Every means of egress shall be maintained to provide safe, continuous and unobstructed access.

19. BARRIERS

A barrier shall be maintained in good repair in accordance with the Code.

20. WALL AND CEILING FINISHES

(a) Every wall and ceiling finish shall be maintained in good repair in accordance with the Code. All holes, loose coverings or other defects shall be repaired to prevent the spread of fire.

(b) Every wall with a fire resistive rating shall be maintained in good repair in accordance with the Code and in a condition which retains its fire resistant quality.

21. FLOORS

Every floor shall be reasonably level, smooth and maintained in good repair.

22. WATER

Every sink, wash basin, bathtub, or shower shall be maintained to provide an adequate supply of hot and cold running water in accordance with the Code.

23. PLUMBING

All plumbing, drain pipes, water pipes and plumbing fixtures in every building and every connecting line to the sewerage system shall be maintained in good working order in accordance with the Code and free from leaks and defects, and all water pipes and appurtenances thereto shall be protected from freezing.

24. BATHROOM AND TOILET ROOM FACILITIES

(a) Every dwelling unit except as provided in Subsection (b) hereof, shall provide and maintain plumbing fixtures consisting of at least:

(i) a flush toilet,
(ii) a wash basin,
(iii) a bathtub or shower.

(b) Nothwithstanding Subsection (a), occupants of more than one dwelling unit may share a flush toilet, wash basin and bathtub or shower provided:

(i) not more than a total of eight persons occupy the dwelling units,
(ii) access to the aforesaid plumbing fixtures may be gained without going through rooms of another dwelling unit or outside the dwelling unit,
(iii) the aforesaid facilities shall be located on the same storey as, or on the next storey up or down from the storey on which the sleeping room is located.

(c) Buildings where people are employed shall have a minimum of one flush toilet and one wash basin supplied with hot and cold running water located in a enclosed room conveniently accessible to the employees.

(d) Latching and locking devices on all bathrooms and toilet rooms shall be maintained in good working order.

25. KITCHENS

(a) Every dwelling unit shall provide and maintain a kitchen sink.

(b) Splash backs and counter tops around kitchen sinks shall be maintained in good repair in accordance with the Code.

26. HEATING SYSTEMS

(a) All heating systems within a dwelling unit shall be maintained to ensure that a room temperature of 21 degrees Celsius measured at 5 feet above floor level and 3 feet from exterior walls in all habitable rooms, bathrooms and toilet rooms is maintained.

(b) Where persons are employed in an enclosed space or room within a building which is not a dwelling unit, and not engaged in active physical activity, the heating system shall be maintained to ensure that a room temperature of not less than 21 degrees Celsius is maintained during normal working hours.

27. ELECTRICAL WIRING

All electrical wiring and lighting equipment shall be maintained in good working order in accordance with the Code.

28. LIGHTING

(a) Every habitable room, expect for a kitchen, shall be maintained such that a window or windows, skylights or translucent panels face directly to the outside with an unobstructed light transmitting area of not less than 5 per cent of the floor area of such room. The glazed area of doors may be considered as a portion of the required window area.

(b) Whenever window wells are used, only that part of the window which is above a 45 degree line projected downwards from the top of the window well shall be used in calculating the required light transmitting area.

(c) Lighting in public halls and stairs shall be maintained in good working order in accordance with the Code.

29. VENTILATION

All systems of ventilation, mechanical or natural, and air conditioning shall be maintained in good working order in accordance with the Code.

30. **SLEEPING ROOM**

No room in any building shall be used for sleeping purposes unless there is a minimum width of 1.83 metres and minimum floor area of 5.574 square metres. At least one half of the required minimum floor area shall have a ceiling height of 2.13 metres and no floor area with a ceiling height of less than 1.37 metres shall be counted.

31. **SIGNS**

All signs and billboards shall be maintained in good repair and any signs which are excessively weathered or faded, or those upon which the paint has excessively peeled or cracked shall be removed, repainted or replaced.

32. **PROJECTIONS**

(a) All canopies, marquees, signs, awnings, stairways, fire escapes, standpipes, exhaust ducts, and similar projections shall be maintained such that they are properly anchored in accordance with the Code and protected from the elements, decay or rust by the periodic application of an approved weather coating material.

(b) All cornices, entablatures, belt courses, corbels, terracotta trim, wall facings, and similar architectural features shall be maintained in good repair and such that they are properly anchored in accordance with the Code.

33. Bylaw No. 4087, as amended, is hereby repealed.

READ a first time this_____ day of __________________, A.D. 198 ;

READ a second time this_____ day of __________________, A.D. 198 ;

READ a third time and finally passed this 8th day of AUGUST ,A.D. 1989.

THE CITY OF EDMONTON

____

MAYOR

____

CITY CLERK

SCHEDULE "A"

First Offence	Penalty
Breach of S.8	$50.00
Breach of any other provision in Part II	$20.00
Second Offence	
Breach of S.8	$100.00
Breach of any other provision in Part II	$50.00
Subsequent Offence	
Breach of S.8	$200.00
Breach of any other provision in Part II	$100.00

APPENDIX M

CITY LETTER AND QUESTIONNAIRE

WALKER CONSULTING GROUP LTD.

SUCCESSOR TO EDMONTON PRACTICE OF WALKER, NEWBY & ASSOCIATES LTD.

CONSULTING ENGINEERS
D. Armstrong, P.Eng.
W.J.G. Courtie, P.Eng.

George C. Walker, A.L.S. P.Eng.

LAND SURVEYORS
S.J. Longson, A.L.S.
Grant Cross, A.L.S., C.L.S.

MUNICIPAL ADDRESS: 9527 - 178 A AVENUE   OCTOBER 18, 1990

Dear Householder:

RE: ASSESSMENT OF LOT REGRADING PROGRAMS

The Alberta Government, Department of Municipal Affairs, is funding a study to assess the value of measures taken by various municipalities to improve lot grading.

Walker Consulting Group Ltd. has been chosen to carry out this study.

A major part of the project is the collection of information regarding the lot regrading program that was recently carried out in your neighbourhood.

The City of Edmonton, has given us permission to approach you and ask you to respond to a questionnaire.

The questionnaire is being distributed to eighty (80) households in your area.

It will be greatly appreciated if you would take about 10 minutes to answer the questions on the attached form and return the completed questionnaire to us in the stamped addressed envelope.

The contents of your questionnaire will be dealt with in strict confidence and used only for compiling data and statistics.

Future lot grading programs will undoubtedly benefit from the information gathered and we thank you very much for your participation in this project.

Yours truly,

WALKER CONSULTING GROUP LTD.

D Armstrong

D. ARMSTRONG, P.ENG., Project Co-ordinator
DA/abp
Encl.
C:\WP50\ENG\DA\QUESTION\CITY\LTR

10836 - 120th STREET, EDMONTON, ALBERTA T5H 3P9 TELEPHONE (403) 452-7860 FAX (403) 452-6808

QUESTIONNAIRE

LOT ____ BLOCK _____ PLAN ______

ASSESSMENT OF LOT REGRADING PROGRAMS

1. NAME OF HOUSEHOLDER ______________________________
2. ADDRESS ______________________________
3. PHONE NUMBER ______________________________
4. DID THE CITY OF EDMONTON INFORM YOU THAT YOUR LOT REQUIRED TO BE REGRADED? YES ___ NO ___

____

5. HOW DID THE CITY INFORM YOU?

LETTER ________________ PHONE ________________
WORD OF MOUTH _________ PAMPHLET ______________

____

6. WHAT IS YOUR UNDERSTANDING OF THE REASONS FOR LOT REGRADING?

____

____

____

____

____

7. DID YOU HAVE A PROBLEM PRIOR TO THE REGRADING PROGRAM?

____

____

____

8. IF SO, WHAT WAS IT? ____________________

____

A. SEEPAGE? ____________________

B. SEWER BACK-UP? ____________________

C. OTHER? ____________________

9. WAS YOUR LOT REGRADED? ____________________

10. IF IT WAS NOT, WHY NOT? ____________________

____

____

____

11. IF IT WAS, WHO GRADED IT? ____________________

____

____

12. DESCRIBE THE WORK DONE ____________________

____

____

____

____

____

____

13. WERE YOU SATISFIED WITH THE LEAD-UP ARRANGEMENTS FOR GRADING?

____

____

14. DID THE REGRADING WORK CAUSE YOU ANY PROBLEMS? IF YES, WHAT PROBLEMS? ______________________________

____

____

____

____

____

15. WHAT DID THE REGRADING WORK COST YOU? ______________

____

16. IN YOUR OPINION WAS THE REGRADING NECESSARY? __________

____

____

17. IN YOUR OPINION DID THE REGRADING DO ANY GOOD? _______

____

____

____

18. DID CITY AND CONTRACTORS KEEP YOU REASONABLY INFORMED DURING THE REGRADING WORK? ____________________

____

____

19. WOULD YOU BE WILLING TO GIVE FURTHER INFORMATION IF REQUESTED?

____

20. WOULD YOU GIVE PERMISSION FOR YOUR LOT TO BE SURVEYED TO GATHER MORE INFORMATION? ____________________

____

21. ANY OTHER COMMENTS? ______________________________

____

____

____

____

____

____

C:\WP50\ENS\DA\QUESTION\CITY.LTR

APPENDIX N

LOT INSPECTION IN 1991

APPENDIX N

ASSESSMENT OF LOT REGRADING PROGRAMS, RELATED BYLAWS AND PUBLIC INFORMATION

LOT INSPECTION IN 1991

1. Description of Inspection

On June 28 and July 5, 1991, thirty two lots were inspected in Lago Lindo; and, on July 18, 1991, thirty one lots were inspected in Sherwood Park, Strathcona County. Figure N1 shows the form used for inspection.

For each lot, five components were inspected:

1. Front
2. Left Side
3. Rear
4. Right Side
5. Roof

The inspections were carried out by two inspectors aided by a carpenter's level tied to a 1.50 m straight edge. Each inspector independently determined the percentage of area of each of the first four components draining towards the house. If the determinations for a component were within 10%, the mean was used and entered on the form in the box adjacent to the component. If the determinations varied by more than 10%, a more detailed inspection was undertaken until consensus was achieved.

Downspouts were inspected to determine whether roof drainage was towards or away from the house. If a downspout discharged on a surface that drained towards the house, the percentage of roof area draining to the downspout was determined and this was entered on the lot inspection form.

2. Treatment of Results

Figure N2 is a typical Lot Inspection Form for a lot inspected in Lago Lindo on June 28, 1991. Results of the inspection of Lot X are summarized as follows:

	Percentage draining towards house
Left Side	100
Back	45
Front	15
Right Side	5
Roof	50

Lot X is an RF1 (single family residential) lot. For an average house on an RF1 lot in Lago Lindo the lot size is 15.3m x 33.5m. The roof is assumed to be 12m x 12m; front set-back 9.0 metres; backyard 12.5 metres deep; and side-yards 1.8 and 1.5 metres.

Each component is expressed in percentages of the total area of the lot:

Front	26.9%
Back	37.3%
Roof	28.1%
Sides	7.7%
Total	100.0%

The percentage of lot draining towards the house in the case of Lot X is derived as follows:

Left Side 100 x .0385 = 3.85
Back 45 x 0.373 = 16.79
Front 15 x 0.269 = 4.035
Right Side 5 x .0385 = 0.193
Roof 50 x 0.281 = 14.05
TOTAL: 38.9

The lot grade efficiency is taken as 100 minus 38.9 = 61.1%.

For RPL (zero lot line) in Lago Lindo, the component percentages were set as follows:

Front	30%
Back	30%
Roof	25%
Sides	15%

In Sherwood Park the lots were developed in 1971. The lots were larger than those in Lago Lindo but the houses were smaller.

Component percentages set for single family residential lots in Sherwood Park were:

Front	26%
Back	47%
Roof	19%
Sides	8%

Tables N1 and N2 show the lot inspection results for Lago Lindo and Sherwood Park respectively. Table N3 itemizes mean lot grade efficiency and assigns lot grade efficiencies to various categories of lot.

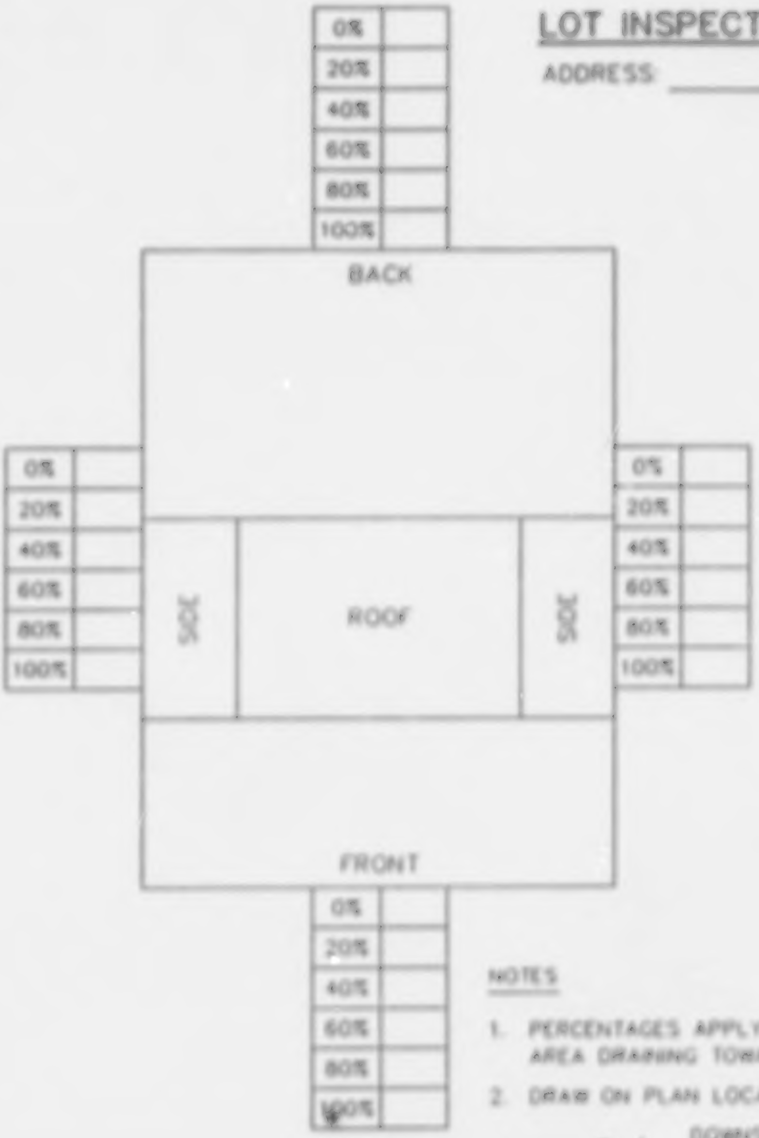
3. Explanation of Categories

The categories are represented by colours and are defined as follows:

"WHITE" - Inspected by Municipality; not rectified.
"RED" - Inspected by Municipality; rectified.
"GREEN" - Inspected by Municipality; found okay.
"ORANGE" - Not inspected by Municipality because lot development was not complete at time of inspection.

LOT INSPECTION FORM

ADDRESS: ____________________


0%
20%
40%
60%
80%
100%
BACK
0%
20%
40%
60%
80%
100%
SIDE
ROOF
SIDE
0%
20%
40%
60%
80%
100%
FRONT
0%
20%
40%
60%
80%
100%

NOTES

1. PERCENTAGES APPLY TO PERCENTAGE OF AREA DRAINING TOWARDS HOUSE.
2. DRAW ON PLAN LOCATIONS OF DOWNSPOUTS.

○✓	DOWNSPOUT DRAINING AWAY FROM HOUSE
○×	DOWN SPOUT DRAINING TOWARDS HOUSE

3. FOR PERCENTAGES, ASSUME THAT PAVED AREAS WITHOUT POSITIVE-SLOPE-AWAY AND DECKS WITH NO POSITIVE-SLOPE-AWAY ALL DRAIN TOWARDS HOUSE.
4. SKETCH IN DECKS AND PAVED AREAS THAT ACCORD WITH 3. ABOVE.

ASSESSMENT OF LOT
REGRADING PROGRAMS

ALBERTA MUNICIPAL AFFAIRS

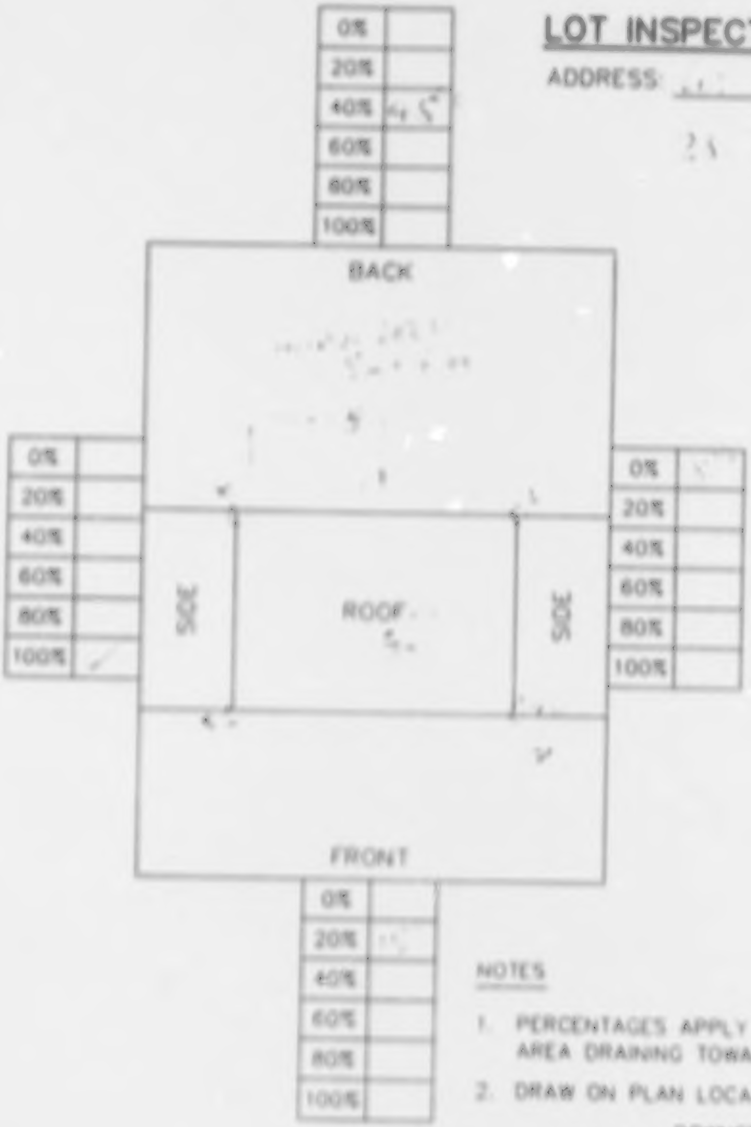
WALKER CONSULTING GROUP LTD.

JUNE 1991

FIGURE N1

LOT INSPECTION FORM

ADDRESS: [illegible]



NOTES

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ASSESSMENT OF LOT
REGRADING PROGRAMS

ALBERTA MUNICIPAL AFFAIRS

WALKER CONSULTING GROUP LTD.

JUNE 1991

FIGURE N2

TABLE N1 - LAGO LINDO, EDMONTON

RESULTS OF LOT INSPECTIONS

ADDRESS	INSPECTION DATE	HOUSE TYPE	AREA OF LOTS M	PERCENTAGE DRAINING TO HOUSE					CATEGORY
				L.SIDE	BACK	FRONT	R. SIDE	ROOF	
-91A STREET	91/06/20	RPL	409	40	10	10	0	0	WHITE
-178A AVENUE	91/06/20	RF1	500	10	50	5	60	0	GREEN
-178A AVENUE	91/06/20	RF1	423	100	45	15	5	50	ORANGE
-178A AVENUE	91/06/20	RF1	610	0	0	0	10	0	GREEN
-95 STREET	91/06/20	RF1	590	40	33	0	33	0	RED
-95 STREET	91/06/20	RF1	565	10	40	0	0	0	WHITE
-95 STREET	91/06/20	RF1	507	0	80	0	20	0	WHITE
-180A AVENUE	91/06/20	RF1	543	10	40	5	0	0	GREEN
-94 STREET	91/06/20	RF1	520	10	70	0	5	5	RED
-94 STREET	91/06/20	RF1	505	20	10	0	40	67	ORANGE
-94 STREET	91/06/20	RF1	406	0	10	10	80	25	ORANGE
-94 STREET	91/06/20	RF1	403	80	25	10	50	0	GREEN
-94 STREET	91/06/20	RF1	430	0	90	5	10	0	RED
-91A STREET	91/06/20	RPL	371	20	30	5	100	40	ORANGE
-91A STREET	91/06/20	RPL	340	100	40	20	50	100	RED
-179 AVENUE	91/06/20	RF1	520	40	30	5	100	0	RED
-179 AVENUE	91/06/20	RF1	640	0	30	10	100	100	WHITE
-92A STREET	91/06/20	RPL	334	5	0	0	5	50	RED
-92A STREET	91/06/20	RPL	420	30	40	10	0	100	WHITE
-92A STREET	91/06/20	RPL	600	0	0	5	0	50	WHITE
-179 AVENUE	91/06/20	RF1	510	50	30	10	100	30	WHITE
-94 STREET	91/06/20	RF1	450	10	0	0	0	0	ORANGE
-91A STREET	91/06/20	RPL	483	20	30	20	10	30	RED
-180A AVENUE	91/06/20	RPL	300	20	40	10	80	30	WHITE
-180A AVENUE	91/06/20	RPL	306	80	30	0	80	100	ORANGE
-180A AVENUE	91/07/05	RPL	310	80	80	5	80	0	WHITE
-180A AVENUE	91/07/05	RPL	310	100	80	5	80	100	ORANGE
-180A AVENUE	91/07/05	RPL	320	40	5	5	0	0	WHITE
-180A AVENUE	91/07/05	RPL	440	5	0	10	100	33	RED
-180A AVENUE	91/07/05	RPL	440	0	5	5	100	33	RED
-180A AVENUE	91/07/05	RPL	640	100	80	5	100	33	RED
-94 STREET	91/07/05	RF1	440	0	80	0	100	0	WHITE

TABLE N2 - SHERWOOD PARK

RESULTS OF LOT INSPECTIONS

ADDRESS	INSPECTION DATE	HOUSE TYPE	AREA OF LOTS M	PERCENTAGE DRAINING TO HOUSE L. SIDE	BACK	FRONT	R. SIDE	ROOF	CATEGORY
GALLOWAY DR.	91/07/18	R1	633	0	5	0	10	0	RED
GALLOWAY DR.	91/07/18	R1	635	100	40	5	80	13	RED
GALLOWAY DR.	91/07/18	R1	588	0	5	5	0	0	GREEN
GALLOWAY CT.	91/07/18	R1	602	20	80	0	10	30	RED
GALLOWAY DR.	91/07/18	R1	583	0	40	0	0	63	RED
GLENBROOK BLVD.	91/07/18	R1	633	10	25	5	20	0	RED
GLENBROOK BLVD.	91/07/18	R1	635	50	80	5	60	30	WHITE
GALLOWAY DR.	91/07/18	R1	653	30	15	5	60	0	WHITE
GALLOWAY DR.	91/07/18	R1	643	80	0	20	20	13	WHITE
GALLOWAY RD.	91/07/18	R1	720	0	30	20	0	0	RED
GALLOWAY RD.	91/07/18	R1	610	10	20	0	30	13	RED
GALLOWAY RD.	91/07/18	R1	820	0	0	0	0	0	RED
GALLOWAY DR.	91/07/18	R1	630	0	60	10	100	50	GREEN
GALLOWAY DR.	91/07/18	R1	630	60	60	10	100	100	RED
GREYSTONE CR.	91/07/18	R1	617	5	30	5	100	50	GREEN
GREYSTONE CR.	91/07/18	R1	691	10	20	5	0	25	RED
GREYSTONE CR.	91/07/18	R1	675	0	40	10	0	50	RED
GLAMORGAN DR.	91/07/18	R1	613	0	20	5	0	0	RED
GLAMORGAN DR.	91/07/18	R1	613	20	30	10	0	100	RED
GLAMORGAN DR.	91/07/18	R1	613	20	20	15	30	25	RED
GLAMORGAN DR.	91/07/18	R1	613	100	20	15	10	50	RED
GLAMORGAN DR.	91/07/18	R1	613	100	10	20	20	0	WHITE
GLAMORGAN DR.	91/07/18	R1	613	100	30	15	30	0	RED
GLAMORGAN DR.	91/07/18	R1	630	10	5	10	0	0	RED
GLAMORGAN DR.	91/07/18	R1	635	0	15	10	60	0	RED
GREYSTONE CR.	91/07/18	R1	669	0	50	0	5	0	RED
GALLOWAY DR.	91/07/18	R1	669	0	0	0	20	13	RED
GALLOWAY DR.	91/07/18	R1	620	0	0	0	0	0	RED
GALLOWAY DR.	91/07/18	R1	669	20	10	30	5	0	WHITE
GALLOWAY DR.	91/07/18	R1	669	10	10	5	0	15	RED
GALLOWAY DR.	91/07/18	R1	669	10	30	5	5	100	RED

TABLE N3

MEAN LOT GRADE EFFICIENCIES

SUMMARY OF FINDINGS

	LAGO LINDO, CITY				SHERWOOD PARK, COUNTY	
	RF1	SINGLE FAMILY	RPL	ZERO LOT LINE		
	NUMBER SURVEYED	% EFFIC.	NUMBER SURVEYED	% EFFIC.	NUMBER SURVEYED	% EFFIC.
ORIGINALLY APPROVED LOTS	4	81.9	0	N/A	3	77.5
CONDEMNED LOTS - NOT RECTIFIED	5	66.7	6	75.7	5	78.9
CONDEMNED LOTS - RECTIFIED	4	73.9	6	69.5	23	79.2
CONDEMNED LOTS RECTIFIED - ROOF DRAINS PROPERLY INSTALLED	4	73.9	6	82.0	23	84.3
EXISTING AVERAGE EFFICIENCY FOR ALL LOTS	17	75.5	15	68.8	31	79.0
EXISTING AVERAGE EFFICIENCY - ROOF DRAINS PROPERLY INSTALLED FOR ALL LOTS	17	80.3	15	81.1	31	83.8

APPENDIX O

RECOMMENDATION FOR A PILOT LOT REGRADING PROGRAM

APPENDIX "O"

ASSESSMENT OF LOT REGRADING PROGRAMS, RELATED BYLAWS AND PUBLIC INFORMATION

RECOMMENDATION FOR A PILOT LOT REGRADING PROGRAM

The purpose of this Appendix is to describe the organization and implementation of a hypothetical pilot lot regrading program for three "sub-cell" areas.

Monitoring of sanitary sewer flows from the three sub-cells has been carried out for three years and the Public Works Department now has knowledge of dry weather and wet weather flows in the sanitary sewer system emanating from these areas. The municipality decides that the lot regrading program should commence in the spring of the year and a senior engineer in the Public Works Department is appointed as Program Supervisor.

A senior technician in the Public Works Department is assigned to coordinate the program, and the program runs as follows:

APRIL

Hire four experienced inspectors from two consulting engineering companies to carry out lot inspections as described in Appendix "P".

Assuming 50 lots in each "sub-cell", 150 lots will be inspected by two teams, with two inspectors in each team. Each lot will be inspected twice over a two week period. If a discrepancy exists between inspection reports on a lot, the lot will be reinspected by the senior technician and the leaders of the inspection teams.

Each inspection team will be expected to inspect 20 lots per day.

Each lot will be assigned a Mean Lot Grade Efficiency and also classed "Mandatory", "Recommended" or "Satisfactory" as per the Strathcona County inspection process.

Time for 150 lots will be 7½ days. With one day briefing and familiarization at the beginning of the project, 1½ will be left for compiling results and rectifying discrepancies.

TIME:	Senior Technician	40 hours	COST:	$1,000
	Consultants	160 hours		6,000
	Program Supervisor	20 hours		1,100

Lot inspection results are reviewed and plans of action are formulated. The text for public education pamphlets is prepared.

TIME:	Senior Technician	60 hours	COST:	$1,500
	Program Supervisor	30 hours		1,600

MAY

The scope of construction work is determined and contract documents are drawn up. The lots in two sub-cells will be regraded in the same manner as lots were regraded in the lot regrading programs in Edmonton and Strathcona County, i.e. no special action will be taken to improve lot grading which entails alterations to decks, patios or concrete areas or which requires a large amount of earthwork. This will henceforth be referred to as 'Class "B" Regrading'.

Class "A" Regrading will include alterations to decks, patios and concrete areas and whatever earthworks are necessary to result in 100% of the lot area draining away from the house. Flat or badly sloped concrete areas will be rectified by removing a metre width of the structure adjacent to the house and replacing it with a concrete swale or concreted half-pipe sloped to convey stormwater away from the building. Class "A" Regrading will be applied to the third sub-cell. The work will be tendered to local companies. The tender period will be two weeks and the tenders will close at the end of May. If the municipality has the resources, consideration could be given to having the work done directly by the municipality.

TIME:	Senior Technician	90 hours	COST:	$2,250
	Program Supervisor	30 hours		1,600
	Draftsman	40 hours		800

During May, public information pamphlets will be prepared and distributed to the 150 households; and a letter will be sent to each lot owner describing the proposed lot regrading work.

TIME:	Senior Technician	60 hours	COST	$1,500.00
	Program Supervisor	10 hours		550.00
	Stenographer	20 hours		300.00

JUNE, JULY, AUGUST AND SEPTEMBER

Construction.

Assume that 70% of the lots are classed as "Mandatory", 20% are "Recommended" and 10% require no regrading.

Two full-time inspectors will either be hired or assigned to the project.

The work force will consist of three crews, each composed of a foreman, four workmen and whatever equipment is required on a day-to-day basis. A construction superintendent will supervise and coordinate the work of the crews.

Based on the City of Edmonton experience, the following costs and crew times have been developed:

	Cost/lot	Crew hours/lot
Class "B", Recommended	$1,100.	6
Class "B", Mandatory	1,600.	10
Class "A", Recommended	2,400.	10
Class "A", Mandatory	4,000.	20

Total costs and times are as follows:

	No. of lots	Total Cost	Time Crew weeks
Class "B", Recommended	20	$22,000.	3
Class "B", Mandatory	70	112,000.	18
Class "A", Recommended	10	24,000.	3
Class "A", Mandatory	35	140,000.	20
TOTALS:	135	$298,000.	44

Total Construction Cost:		$298,000
Other Costs:		
Two Inspectors	1,360 hours (17 weeks x 40 hours x 2)	: $27,200
Senior Technician	304 hours (17 weeks x 20 hours)	: 8,500
Program Supervisor	170 hours (17 weeks x 10 hours)	: 9,350
Secretarial	85 hours (17 weeks x 5 hours)	: 1,275

OCTOBER

When construction is completed, the Contractor's work will be inspected and accepted after rectification of all contractual deficiencies. Measurement and documentation for final payment will be carried out by the inspection staff.

TIME:	Senior Technician	12 hours	COST:	$300
	Two Inspectors	40 hours		800

To finalize the "sub-cell" operation, it is recommended that the consultant inspection teams be rehired to survey and assign Mean Lot Grade Efficiencies to the completed work.

TIME:	Senior Technician	40 hours	COST:	$1,000
	Consultants	160 hours		6,000
	Program Supervisor	20 hours		1,100

A final report on the Lot Regrading Program for the three sub-cells will be compiled and preparations will be made for a further two or three years' monitoring.

TIME:	Senior Technician	60 hours	COST:	$1,500
	Program Supervisor	25 hours		1,300
	Secretarial	8 hours		120

COST OF THE PROGRAM:

Construction	$298,000
Staff and Consultants Payroll	76,645
Estimated Disbursements (10%)	7,665
Administration and Overhead (15%)	11,500
Contingency (10% of construction)	29,790
TOTAL:	$423,600

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APPENDIX P

GUIDELINE FOR LOT DRAINAGE CONTROL BYLAW

APPENDIX "P"

ASSESSMENT OF LOT REGRADING PROGRAMS, RELATED BYLAWS AND PUBLIC INFORMATION

GUIDELINE FOR LOT DRAINAGE CONTROL BYLAW

The purpose of this Appendix is to present an outline for a bylaw that may be enacted by a municipality to control lot grading and drainage, and to enable it to enforce lot regrading.

1. Title of the bylaw,
   "LOT DRAINAGE CONTROL BYLAW"
2. Preamble should make reference to the pertinent articles in the current edition of the Municipal Government Act.
3. Using the City of Edmonton Bylaw No. 9198 "Minimum Property Standards Bylaw" as a guide, see Appendix "L", the Bylaw should be divided into two parts,
   PART I - ADMINISTRATION
   PART II - STANDARDS
4. Part I, ADMINSTRATION, will consist of the following:
   .1 DEFINITIONS
   .2 APPLICATION - The bylaw refers to all properties in the Municipality
   .3 OFFICERS AND INSPECTORS - Who is authorized to inspect and administer
   .4 RIGHT OF ENTRY - e.g.
   "The Municipality and duly authorized employees of the Municipality bearing proper credentials and identification, shall be permitted to enter upon all properties for the purpose of inspection, observation, measurement, sampling and testing in accordance with the provisions of this bylaw." (adapted from County By-Law 15-78)

   The bylaw should make provision for action to be taken if entry is refused.

.5 ENFORCEMENT - e.g.

"Where property has not been maintained in compliance with the minimum drainage standards established pursuant to this By-Law the Engineer may send a written notice to or serve a notice upon the owner of the property, and all other persons who by the records of the Land Titles Registration Office to have an interest in the Property, and on the occupant, if any,

(a) stating that the Property does not comply with the minimum drainage standards prescribed in this By-Law and that repairs are required to be made to it, giving reasonable particulars of the repairs required to be made;

(b) stating the time within which the repairs are to be made which shall be a minimum of two (2) months; and

(c) stating that if the repair is not so done within the terms specified, the Municipality, through its agents, employees or contractors may carry out the repairs and the cost of the work done may be levied against the Property as a debt due to the municipality, or charged against the land concerned as taxes due and owing in respect of that land and to recover the costs as such" (adapted from County By-Law 10-87)

5. Part II - STANDARDS will consist of the following

.1 GENERAL - e.g.

"The standards specified herein will apply to all areas within the building site and are to supplement the Alberta Building Code and the municipal Land Use By-Law."

.2 LOT GRADING - e.g.

"The finished elevations at all corners of the lot and at changes in slope on the lot and at the ground next to the building will be as approved by the Municipality and as specified on the Building and/or Development Permit.

Any changes must be approved, in writing, by the Municipality" (adapted from County By-Law 10-87).

.3 SITE DRAINAGE - e.g.

"Positive drainage must be established away from the building to the gutter or drainage swales as designed.

A minimum gradient of 10% shall be established and maintained for the area within 1.5 metres adjacent to the building and 2% for the balance of the lot."

.4 DRAINAGE OF BUILDING FOUNDATIONS

Reference should be made to whatever system of weeping tile drainage is in place in the Municipality.

.5 DOWNSPOUT[illegible]ROM ROOF DRAINAGE - e.g.

"All roof drainage will be to downspouts, and the downspouts shall have extensions such that discharge takes place at least 1.8 metres from basement walls."

.6 SITE IMPROVEMENTS - e.g.

"Site improvements shall not alter or disrupt the drainage pattern approved by the Municipality.

Landscaping and structures such as decks, driveways, concrete slabs, patios, retaining walls and permanent or temporary buildings which may cause drainage patterns contrary to these standards shall not be permitted."